 <p>CERTIFICATE 2518.08</p> <p>MS ISO/IEC 17025 TESTING SAMM NO. 0825</p>
<p>MOTOROLA PENANG ADV. COMM. LABORATORY Motorola Solutions Malaysia Sdn. Bhd. Plot 2A Medan Bayan Lepas, Mukim 12, S.W.D. 11900 Bayan Lepas, Penang, Malaysia.</p>	<p>FCC / ISED TEST REPORT Report Revision : Rev.C</p>
<p>Date/s Tested : 28-Mar-2022 - 22-May-2022 Report Issue Date : 21-Jun-2022 Manufacturer/Location : Motorola Solutions Malaysia Sdn Bhd Plot 2A, Medan Bayan Lepas, Mukim 12 SWD, 11900, Bayan Lepas, Penang, Malaysia Requestor : SIEW KHENG TAN Product Type : Hand-held Product Version (PMN) : MSLB-MKZ920 Model Number (HVIN) : AAH90UCU9RH1AN Frequency Band : 2.412-2.462 GHz Max RF Output Power : 802.11b - 56.23 mWatts 802.11g - 56.23 mWatts 802.11(HT20) - 56.23 mWatts 802.11(HT40) - 56.23 mWatts Applicant Name : Motorola Solutions Inc Applicant Address : 8000 West Sunrise Boulevard, Fort Lauderdale, Florida 33322 FCC Registrations : 461337 ISED Registrations : MY0001 Firmware Version (FVIN) : D00.01.86_D02.22.01.0103 The equipment was tested accordance to the requirement listed below: (2.4GHz Wifi) PASS 47CFR Part 15C ISED RSS 247 Issue 2 February 2017</p>	
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REVISION HISTORY

Revision History	Description	Date	Originator
Rev. A	Initial Report	27-Apr-2022	Gan Boon Teong
Rev. B	Remove Tanapa on cover page, Update RE and CE data	21-Jun-2022	Gan Boon Teong
Rev. C	Update General Information and Summary of Test Results	20-Jul-2022	Gan Boon Teong

1.0. General Information

EUT Description:

Technologies	2.4GHz Wi-Fi
TX Frequency range	2412MHz – 2462MHz
Modulation Type	DSSS, OFDM
Connector type	PROGRAMMING, TEST & ALIGNMENT CABLE
Antenna type	BT/WIFI ANTENNA

1.1. Channel number and frequency information:

There are two bandwidth systems.

For 20MHz Bandwidth systems (802.11b, 802.11g, 802.11n), use channel 1 ~ channel 11

For 40MHz Bandwidth systems (802.11n), use channel 3 ~ channel 9

Channel	Frequency	Channel	Frequency
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437		

The EUT contains following accessory devices and data cable:

Item	Brand	Model or P/N
BATTERY PACK,BATTERY PACK,IMPRES GEN2, LIION,IP68, 4400T, TIA4950	MOTOROLA	PMNN4805A
CABLE,PORT PROG,TEST AND ALIGN CABLE PSA	MOTOROLA	PMKN4231A
Charger: PMPN4498A=base (PMPN4497A (PMPN4497A-C9) + PSU(3087791G01)	MOTOROLA	PMPN4498A

General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, the EUT is to comply with the requirements of the following standards:

FCC 47 CFR Part 15 Subpart C
KDB 558074 D01 15.247 Meas Guidance v05
ANSI C63.10-2013

Deviation from standard

Not applicable as no deviation from standard test method

Modifications to EUT

For RF conducted measurements a pigtail was soldered out of the board while for radiated measurements there were no modifications to the device

2.0. Summary of Test Results

FCC Clause	IC Clause	Test Item	Result	Remark	Serial number tested	Tested by
15.247 (a)(2)	RSS-247 5.2(a)	DTS & 99% Channel Bandwidth	Pass	Highest 99% OCB: 802.11b: 13.785 MHz(13M8G1D) 802.11g: 16.720 MHz(16M7D1D) 802.11n(HT20): 17.839 MHz(17M8D1D) 802.11n(HT40): 36.253 MHz(36M3D1D)	734TYF0020	Gan
15.247 (b)(3)	RSS-247 5.4(d)	Conducted RF Output Power (Average)	Pass	Highest output power: 802.11b: 16.454 dBm (44.20 mW) 802.11g: 17.012 dBm (50.26 mW) 802.11n(HT20): 16.890 dBm (48.87 mW) 802.11n(HT40): 16.907 dBm (49.06 mW)	734TYF0020	Gan
15.247(e)	RSS-247 5.2(b)	Maximum Power Spectral Density	Pass	References data from FCC ID AZ489FT7133 / ISED 109U-89FT7133	NA	NA
15.247(d)	RSS-247 5.5	Conducted Spurious Emissions	Pass	References data from FCC ID AZ489FT7133 / ISED 109U-89FT7133	NA	NA
15.247 (d)	RSS-247 5.5	Band edge Conducted Spurious Emission	Pass	References data from FCC ID AZ489FT7133 / ISED 109U-89FT7133	NA	NA
15.205, 15.209, 15.247 (d)	RSS-247 5.5	Radiated Emission within Restricted Bands	Pass	Worst case emission: RBE: spur: 44.9889dBuV/m (Av) (margin: 9.011dB) RSE: spur: 25.8051dBuV/m (margin: 14.1949dB)	734TYF0069, 734TYF0065, 734TYF0066	Nazrin&Qawiman
15.207	RSS-Gen 8.8	AC Power Line Conducted Emission	NA	NA	734TYF0069, 734TYF0065, 734TYF0066	Alif
15.203		Antenna requirement	NA	Internal antenna is not accessible to the enduser	NA	NA

NA → Not Available

***NOTE: The BT chipset is identical to FCC ID AZ489FT7133 / ISED 109U-89FT7133. The rest of conducted measurements are by similarity. Only worst case configuration of radiated emission based on FCC ID AZ489FT7133 / ISED 109U-89FT7133 is tested. As per KDB 484596 D01v01, the applicant takes full responsibility that data referenced represents compliance to the relevant rules for this current FCC ID.**

3.0. Measurement Uncertainty

Measurement	Frequency	Expanded Uncertainty (k=1.96) (±dB)
AC Power Line Conducted Spurious Emission	150KHz ~ 30MHz	3.48
Radiated Emissions up to 1 GHz	30MHz ~ 1000MHz	5.88
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	5.84
	18GHz ~ 40GHz	6.02
Conducted Spurious Emissions	9kHz ~ 12.75GHz	2.82

4.0. Equipment List

Bluetooth ATE # 1 (SW Version: Ate Main_3.1.11)

Description	Model	Serial Number	Calibration Date	Calibration Due Date
ANALYZER SPECTRUM	E4440A	US45303111	14-Jul-21	14-Jul-22
CHAMBER	SH-641	92003820	14-Jul-21	14-Jul-22
POWER SUPPLY	6652A	MY40001436	22-Nov-21	22-Nov-22
N to N RF Cable # 1	SF126/11N/11N	NA	NA	NA

Radiated Emission Station (SW Version: EMC FCC RE v1.6.4)

Description	Model	Serial Number	Calibration Date	Calibration Due Date
DRG HORN FREQ.	SAS-571	720	06-Apr-21	06-Apr-23
DRG HORN FREQ.	SAS-571	719	13-Sep-21	13-Sep-22
POWER SUPPLY	N7976A	MY53410110	24-May-21	24-May-22
SIGNAL GENERATOR	SMB 100A	182511	4-Jun-21	4-Jun-24
EMI TEST RECEIVER	ESW44	101731	5-Nov-21	5-Nov-22
5m SEMI-ANECHOIC CHAMBER	S800-HX	J2308	NA	NA
BILOG ANTENNA	CBL6112D	55546	06-Jun-21	06-Jun-22
BILOG ANTENNA	CBL6112D	30991	05-Oct-21	05-Oct-22
HYGRO-THERMOMETER	SDL500	A.016800	18-May-21	18-May-22
SYSTEM CONTROLLER	SC104V	050806-1	NA	NA
TURNTABLE FLUSH MOUNT 2M	FM2011	NA	NA	NA
ANTENNA POSITIONING TOWER	TLT2	NA	NA	NA
BROAD-BAND HORN ANTENNA	BBHA9170	BBHA9170143	3-Aug-21	3-Aug-22
PREAMPLIFIER 18-40GHz	BBV9721	9721-007	NA	NA
PREAMPLIFIER	PAM-0118P	361	11-Sep-20	11-Sep-23
LOOP ANTENNA	6502	00208416	8-Oct-21	8-Oct-22

AC Powerline Station(SW Version: EMC 32 V10.60.10)

Description	Model	Serial Number	Calibration Date	Calibration Due Date
TEMPERATURE & HUMIDITY LOGGER	DSB	16344143	29-May-21	29-May-22
V-NETWORK 2-LINE	ENV216V	101268	19-Aug-21	19Aug-22
EMI TEST RECEIVER	ESCI	10025	5-Feb-21	5-Jun-22
PROGRAMMABLE AC SOURCE	61604	ABR000000926	14-Jul-21	14-Jul-22

5.0. Test Mode Applicability and Test Channel Detail

The device employs SISO technology. Below are the possible configurations.

WLAN Configurations		Mode					
		SISO		Spatial Diversity Multiplexing (MIMO)		Cyclic Delay Diversity (MIMO)	
	Antenna	Primary	Secondary	Primary	Secondary	Primary	Secondary
2.4GHz	802.11b	√	√	x	x	x	x
	802.11g	√	√	x	x	x	x
	802.11n (HT20)	√	√	x	x	x	x
	802.11n (HT40)	x	x	x	x	x	x

√ = Support;
 x = NOT Support

Note: This Device supports simultaneous transmission operation, which allows for two SISO or two MIMO channels to operate independent of one another in the 2.4GHz band on each antenna. 802.11n mode is capable of transmitting simultaneously on two antennas using Cyclic Delay Diversity and Spatial Diversity Multiplexing (2x2 MIMO).

The following tables show the worst case configurations determined during testing. The data for these configurations is contained in this test report.

Radiated Emission Test (Above 1GHz)

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Modulation	Available Channel	Tested Channel	Modulation Technology	Data Modulation Type	Date Rate (Mbps)	Mode	Environmental Conditions
Test Mode	802.11b	1 to 11	1,6,11	DSSS	DBPSK	1	SISO	23.3°C, 69.5%RH
Test Mode	802.11g	1 to 11	1,6,11	OFDM	BPSK	6	SISO	23.3°C, 69.5%RH
Test Mode	802.11n (HT20)	1 to 11	1,6,11	OFDM	BPSK	6.5	SISO CDD	23.3°C, 69.5%RH
Test Mode	802.11n (HT40)	3 to 9	3,6,9	OFDM	BPSK	13.5	SISO CDD	23.3°C, 69.5%RH

Radiated Emission Test (Below 1GHz)

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Modulation	Available Channel	Tested Channel	Modulation Technology	Data Modulation Type	Date Rate (Mbps)	Mode	Environmental Conditions
Test Mode	802.11b	1 to 11	1,6,11	DSSS	DBPSK	1	SISO	23.3°C, 69.5%RH
Test Mode	802.11g	1 to 11	1,6,11	OFDM	BPSK	6	SISO	23.3°C, 69.5%RH
Test Mode	802.11n (HT20)	1 to 11	1,6,11	OFDM	BPSK	6.5	SISO CDD	23.3°C, 69.5%RH
Test Mode	802.11n (HT40)	3 to 9	3,6,9	OFDM	BPSK	13.5	SISO CDD	23.3°C, 69.5%RH

Power Line Conducted Emission Test

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Modulation	Available Channel	Tested Channel	Modulation Technology	Data Modulation Type	Date Rate (Mbps)	Environmental Conditions
Application Mode	802.11bgn mixed	1 to 11	AUTO	DSSS, OFDM	AUTO	AUTO	19.8°C, 65%RH

Antenna Port Conducted Measurement:

This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Modulation	Available Channel	Tested Channel	Modulation Technology	Data Modulation Type	Data Rate (Mbps)	Mode	Environmental Conditions
Test Mode	802.11b	1 to 11	1,6,11	DSSS	DBPSK	1	SISO	25°C, 54.8%RH
Test Mode	802.11g	1 to 11	1,6,11	OFDM	BPSK	6	SISO	25°C, 54.8%RH
Test Mode	802.11n (HT20)	1 to 11	1,6,11	OFDM	BPSK	6.5	SISO CDD	25°C, 54.8%RH
Test Mode	802.11n (HT40)	1 to 11	3,6,9	OFDM	BPSK	13.5	SISO CDD	25°C, 54.8%RH

Duty Cycle of Test Signal

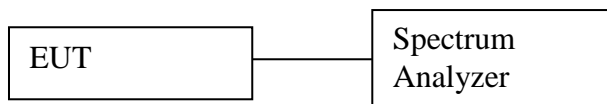
802.11b, 802.11g and 802.11n(HT20) : Duty cycle of test signal is $\geq 98\%$.

802.11n(HT40) : Duty cycle of test signal is $\leq 98\%$. (Refer to Clause 6.3 for duty cycle test signal)

6.0. Transmitter Test Parameters

6.1. 6dB Channel Bandwidth

6.1.1. Test Setup



- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the DUT and set DUT to transmit maximum power.
- c) Connect DUT's antenna terminal to spectrum analyzer with a low loss cable.
- d) Setting of Spectrum analyzer :
 - a. RBW = 100 kHz
 - b. VBW = 300 kHz
 - c. Detector mode = Peak
 - d. Trace = Max hold
 - e. Sweep = auto
- e) Measure the freq different of two frequencies that were attenuated 6dB from peak of the emission & record the frequency difference as the emission bandwidth.
- f) Measure every antenna port by repeat the step above for MIMO measurement.

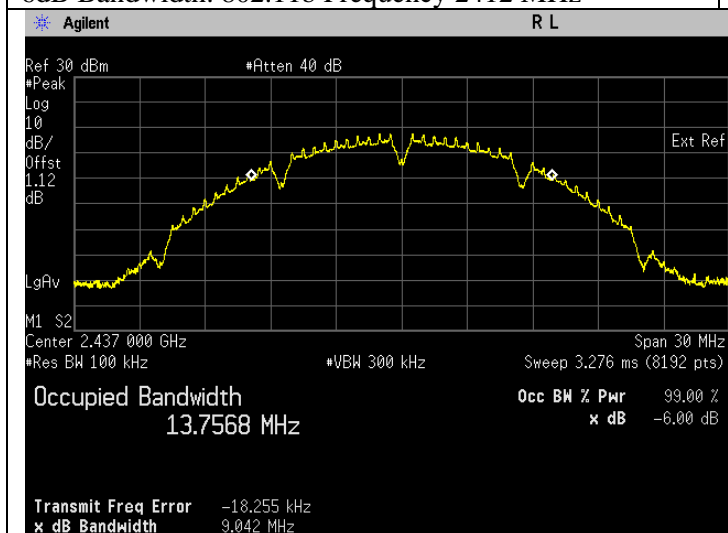
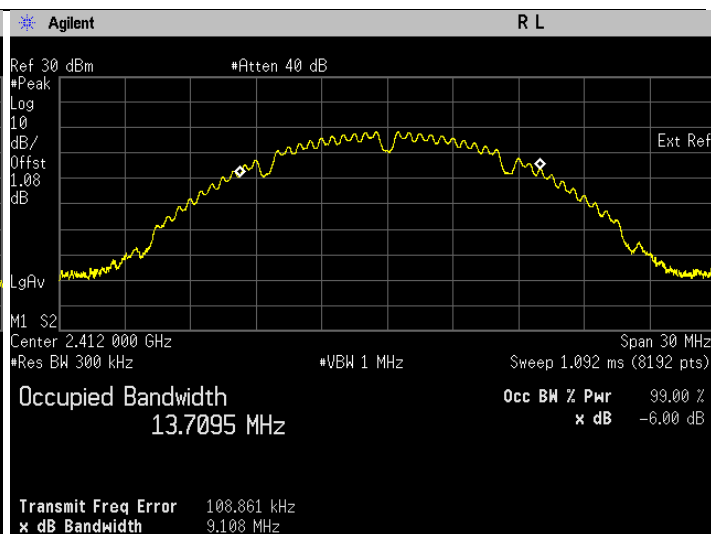
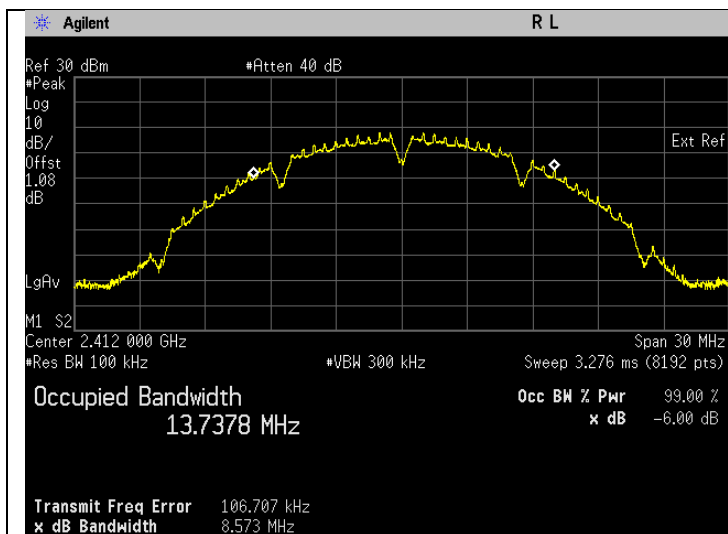
6.1.2. Test Limits:

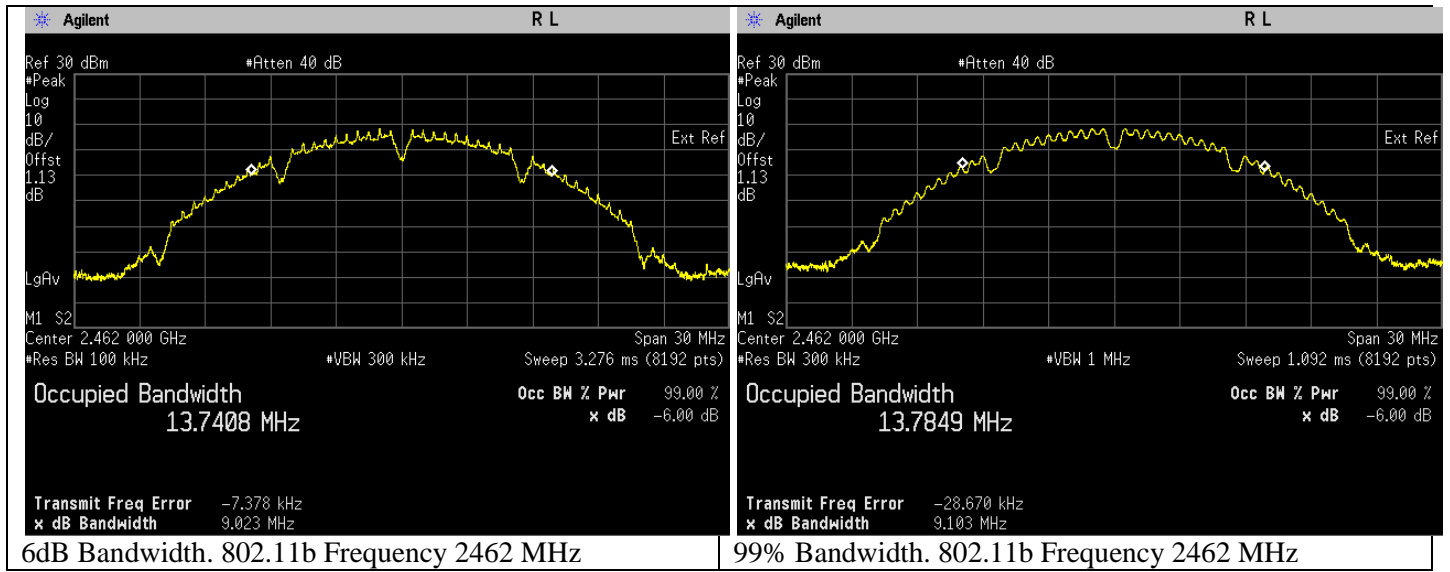
Normal Condition (25 ° C)
≥500 kHz

6.1.3. Test Data:

802.11 b

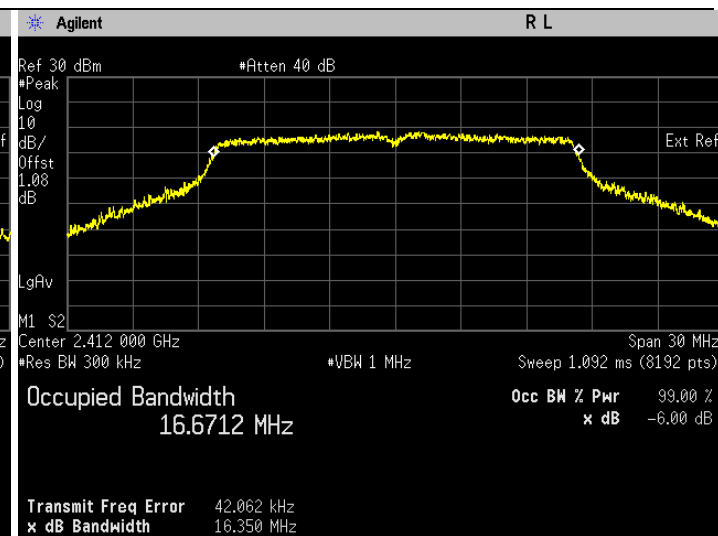
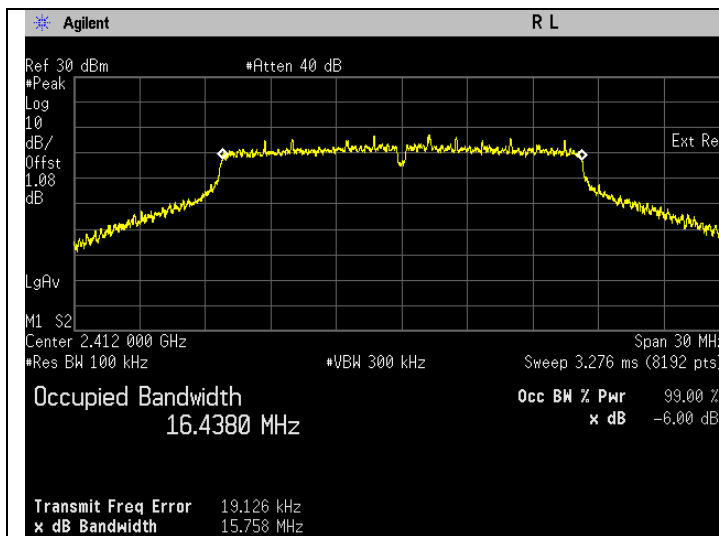
Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Status
802.11b	DSSS	DBPSK	1	2412	8.573	13.710	Pass
802.11b	DSSS	DBPSK	1	2437	9.042	13.757	Pass
802.11b	DSSS	DBPSK	1	2462	9.023	13.785	Pass





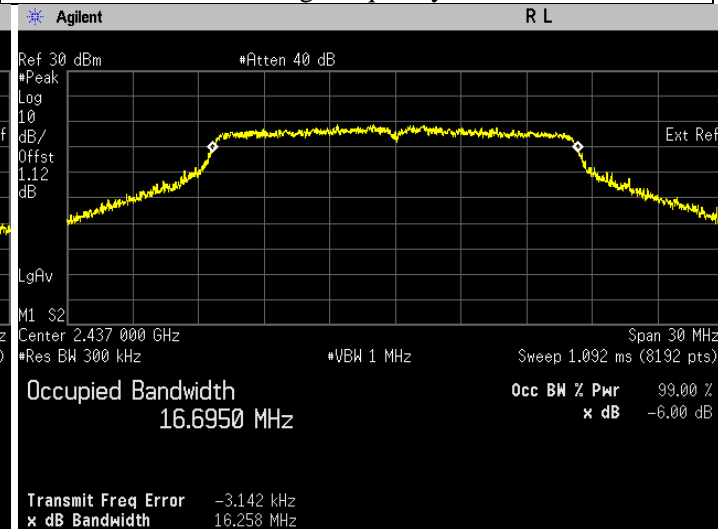
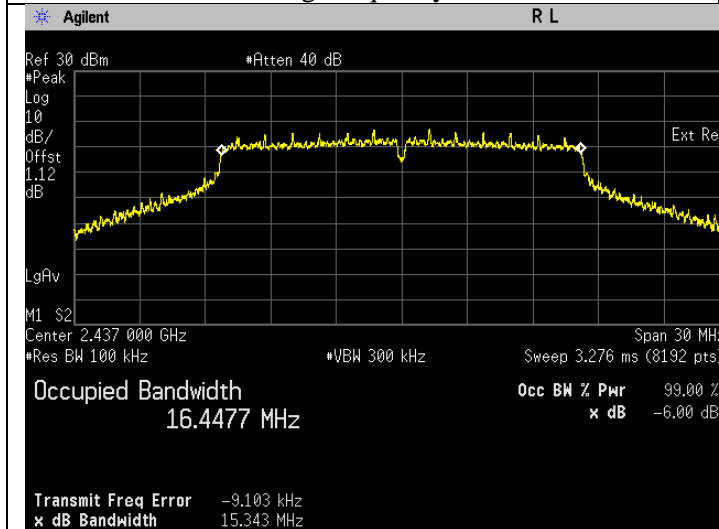
802.11 g

Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (Mbps)	Tx (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Status
802.11g	OFDM	BPSK	6	2412	15.758	16.671	Pass
802.11g	OFDM	BPSK	6	2437	15.343	16.695	Pass
802.11g	OFDM	BPSK	6	2462	16.320	16.720	Pass



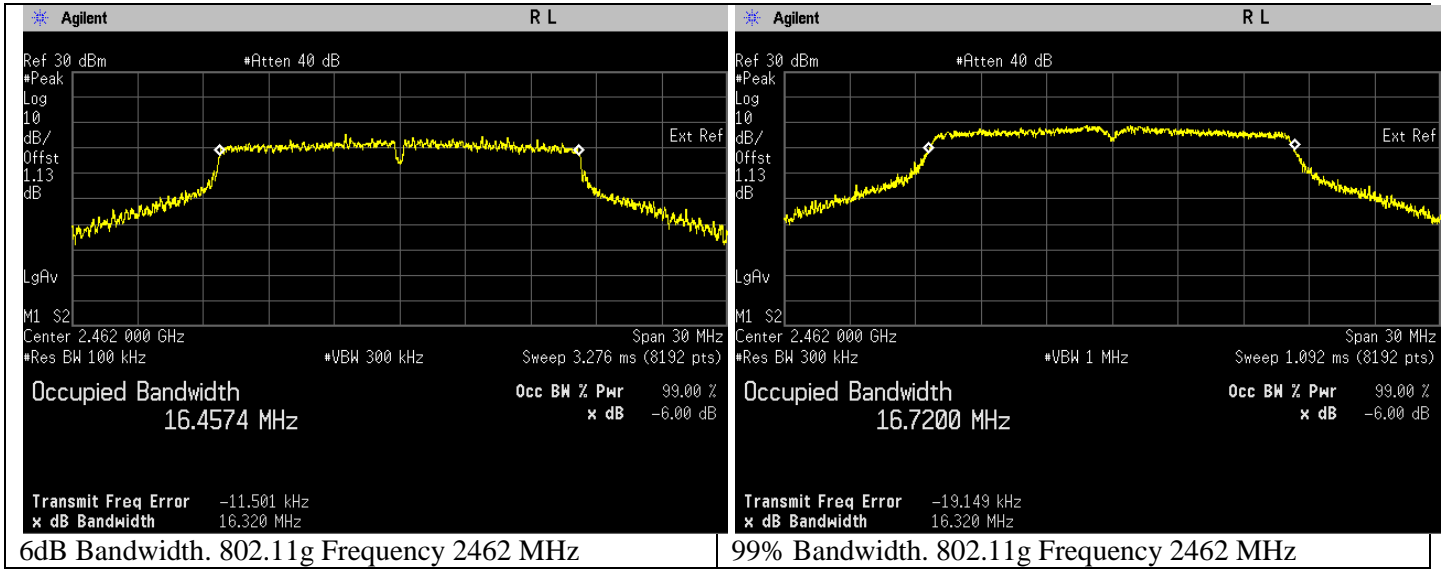
6dB Bandwidth. 802.11g Frequency 2412 MHz

99% Bandwidth. 802.11g Frequency 2412 MHz



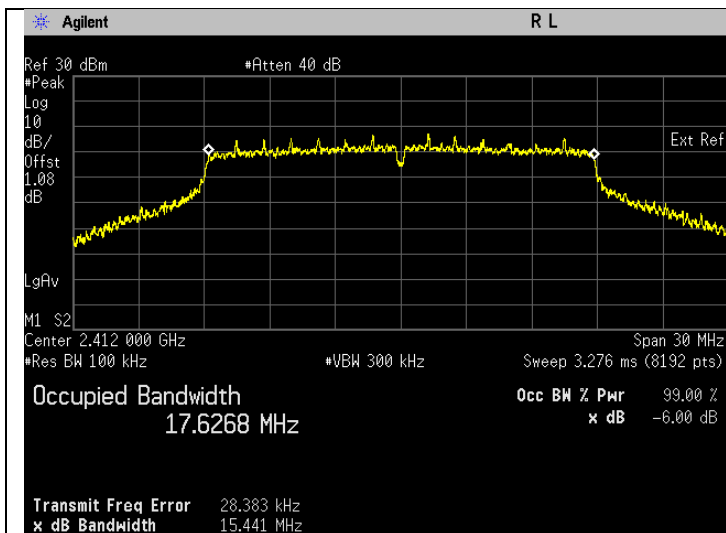
6dB Bandwidth. 802.11g Frequency 2437 MHz

99% Bandwidth. 802.11g Frequency 2437 MHz

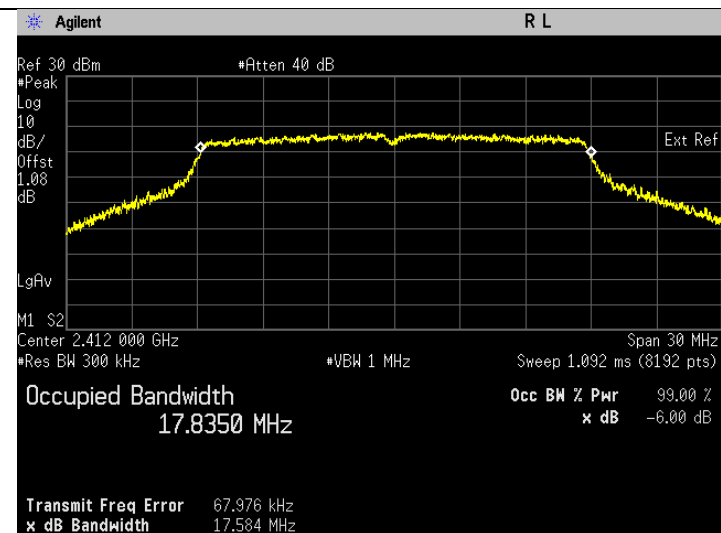


802.11n (HT20)

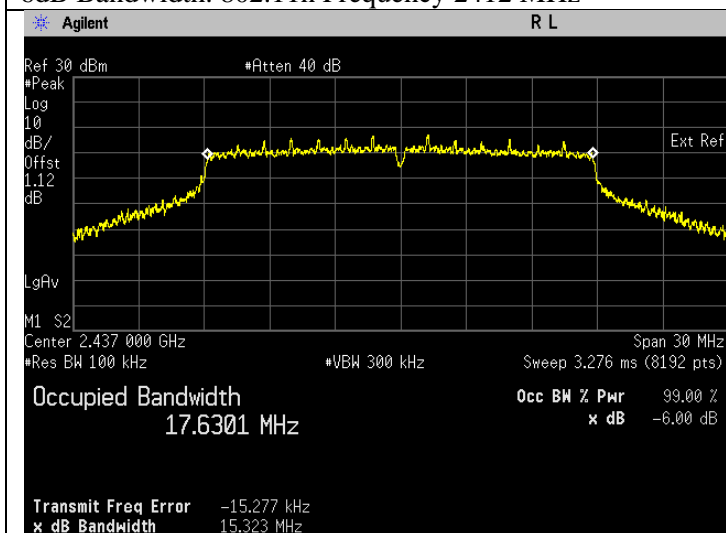
Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Status
802.11n	OFDM	BPSK	6.5	2412	15.441	17.835	Pass
802.11n	OFDM	BPSK	6.5	2437	15.323	17.839	Pass
802.11n	OFDM	BPSK	6.5	2462	15.330	17.824	Pass



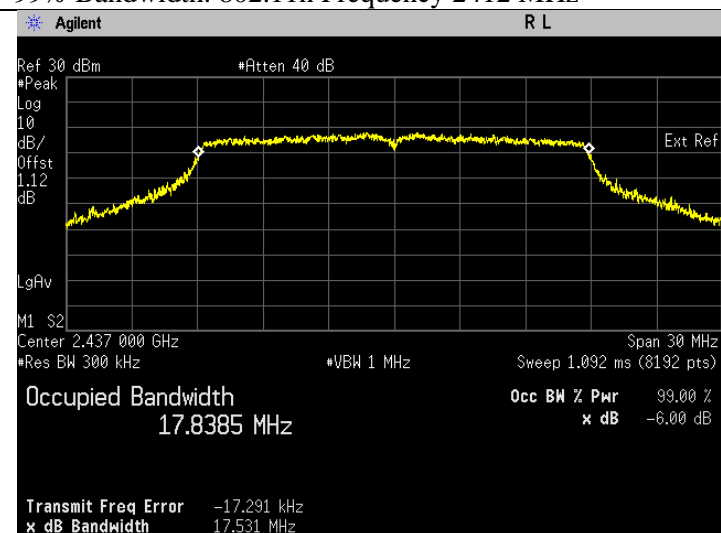
6dB Bandwidth. 802.11n Frequency 2412 MHz



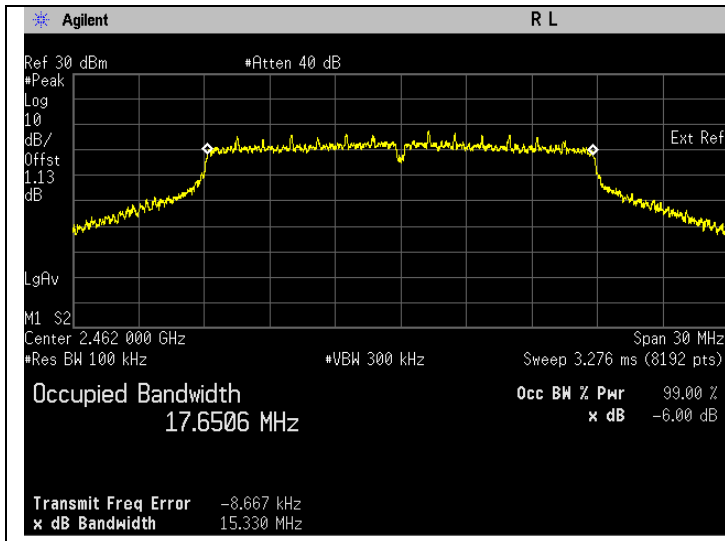
99% Bandwidth. 802.11n Frequency 2412 MHz



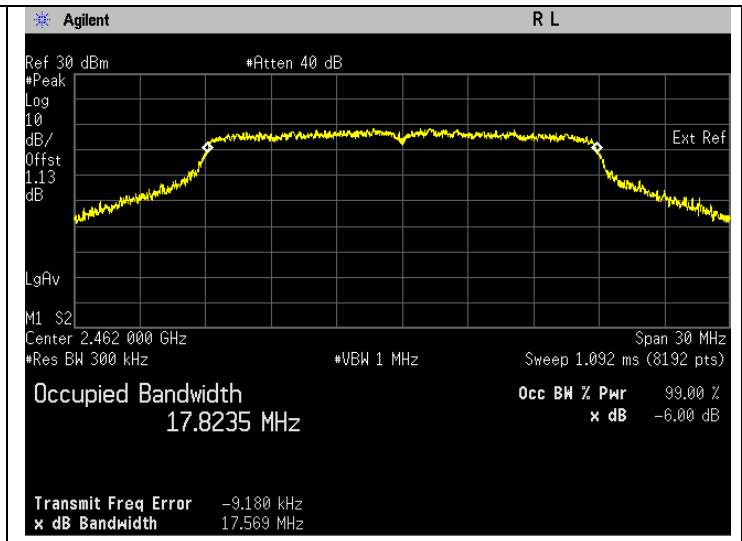
6dB Bandwidth. 802.11n Frequency 2437 MHz



99% Bandwidth. 802.11n Frequency 2437 MHz



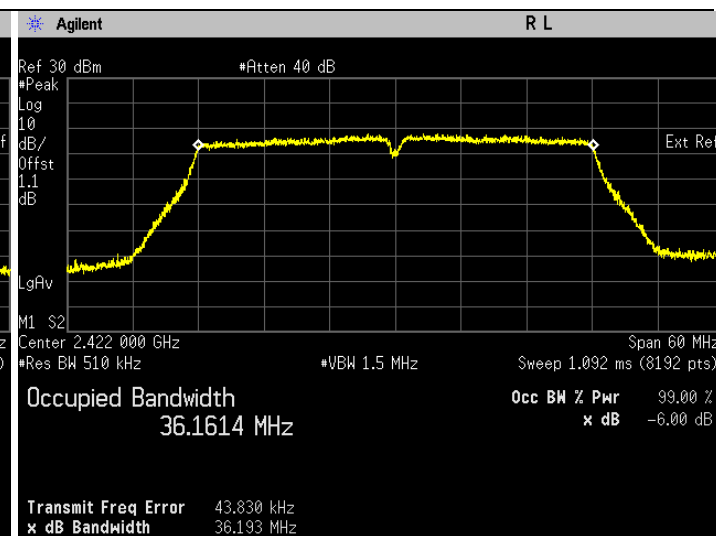
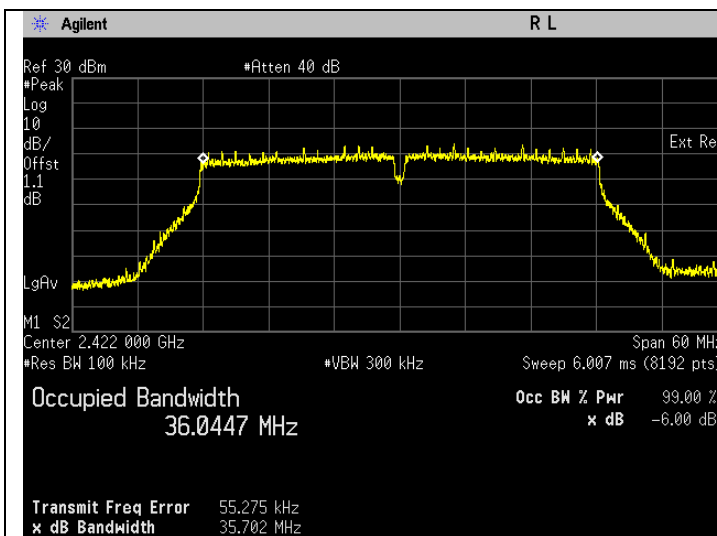
6dB Bandwidth. 802.11n Frequency 2462 MHz



99% Bandwidth. 802.11n Frequency 2462 MHz

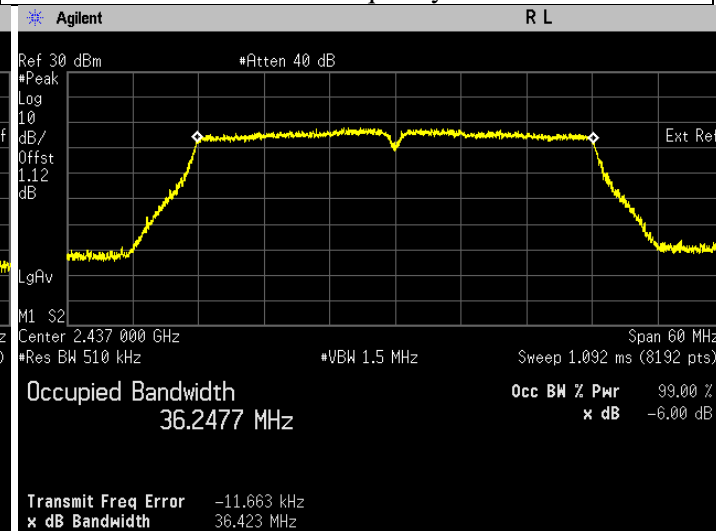
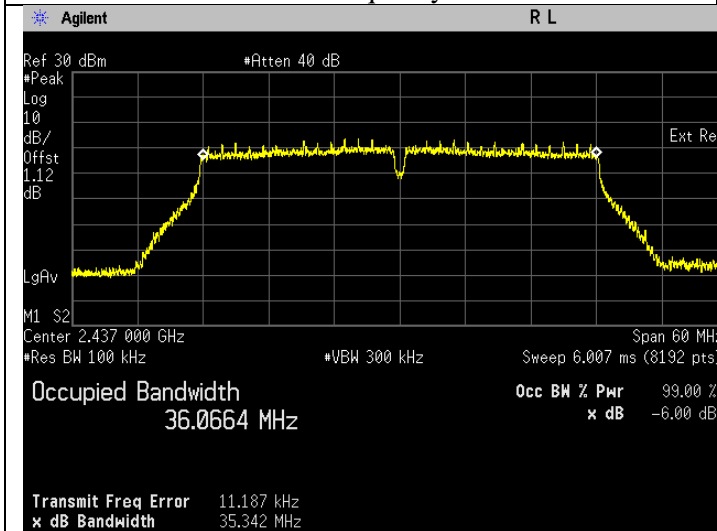
802.11n (HT40)

Test Conditions				Test Frequency	Results		
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Status
802.11n	OFDM	BPSK	13.5	2412	35.702	36.161	Pass
802.11n	OFDM	BPSK	13.5	2437	35.342	36.248	Pass
802.11n	OFDM	BPSK	13.5	2462	35.937	36.253	Pass



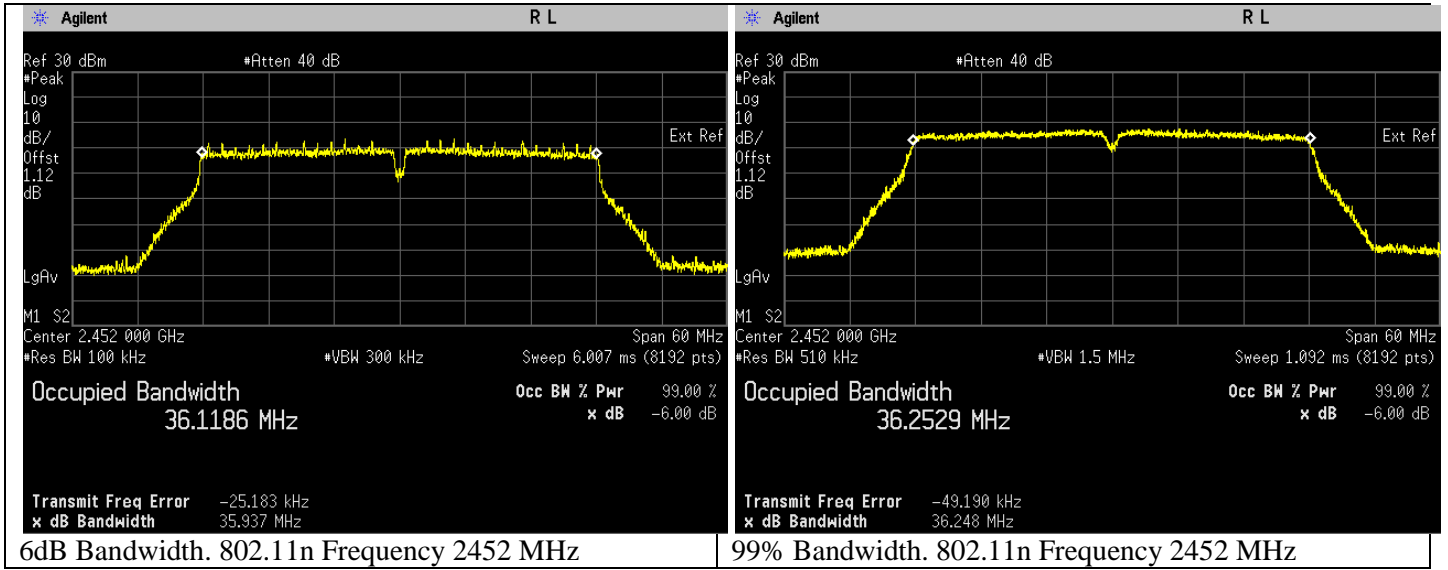
6dB Bandwidth. 802.11n Frequency 2422 MHz

99% Bandwidth. 802.11n Frequency 2422 MHz



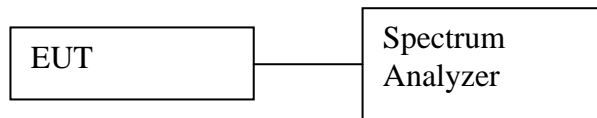
6dB Bandwidth. 802.11n Frequency 2437 MHz

99% Bandwidth. 802.11n Frequency 2437 MHz



6.2. Conducted RF Output Power

6.2.1. Test Setup



Average

- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the DUT and set DUT to transmit maximum power.
- c) Measure the duty cycle of transmitter output signal.
- d) Setting of Spectrum analyzer :
 - a. Set the RBW = 300 kHz.
 - b. Set the VBW $\geq [3 \times \text{RBW}]$.
 - c. Set the span $\geq [1.5 \times \text{OBW bandwidth}]$.
 - d. Detector = average.
 - e. Sweep time = auto couple.
 - f. Trace mode = free run.
 - g. Allow trace to fully stabilize.
- e) Add in duty cycle correction into final test result.
- f) Duty cycle correction is calculated as below:
 $10 \log (1/x)$
- g) Measure every antenna port by repeat the step above for MIMO measurement.

6.2.2. Test Limits:

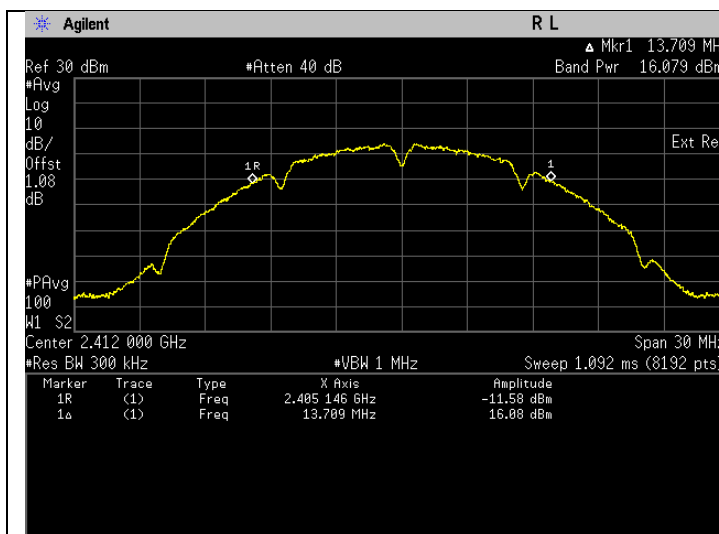
Normal Condition (25 ° C)
$\leq 1 \text{ Watt}(30 \text{ dBm})$

6.2.3. Test Data:

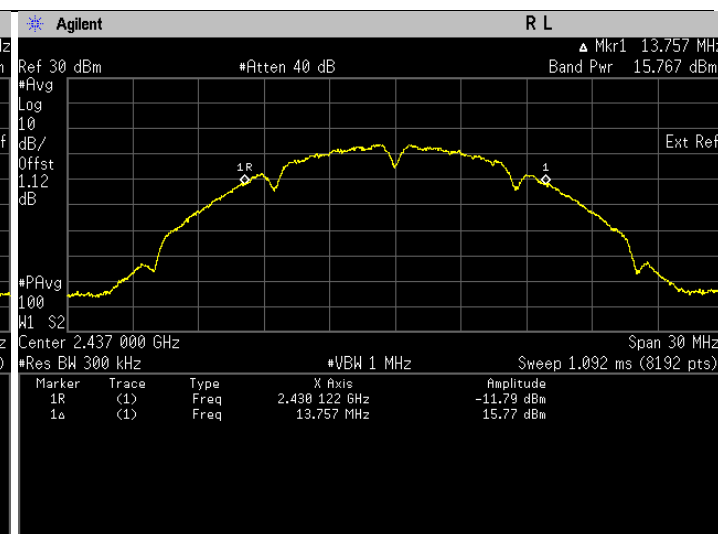
802.11b

$$\begin{aligned} \text{Output Power} &= \text{Band Power} + \text{Duty Cycle Factor} \\ &= \text{Band Power} + 0.081\text{dBm} \end{aligned}$$

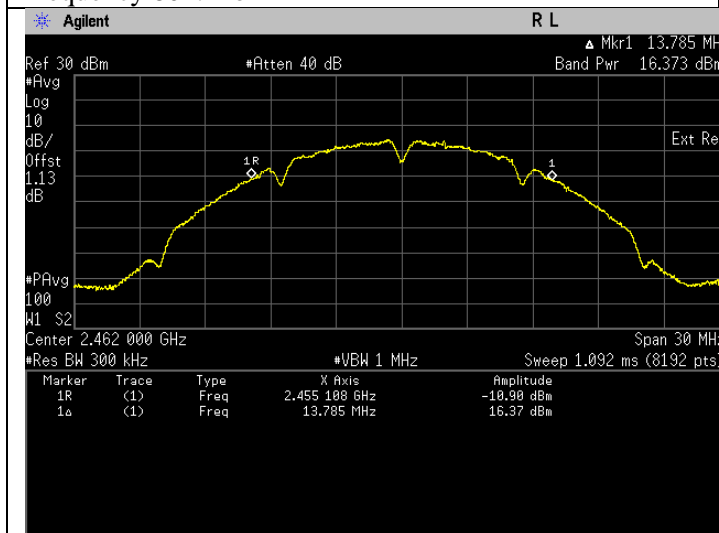
Test Conditions				Test Frequency	Results	
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Output Power (dBm)	Status
802.11b	DSSS	DBPSK	1	2412	16.160	Pass
802.11b	DSSS	DBPSK	1	2437	15.848	Pass
802.11b	DSSS	DBPSK	1	2462	16.454	Pass



Frequency 802.11b MHz



Frequency 802.11b MHz



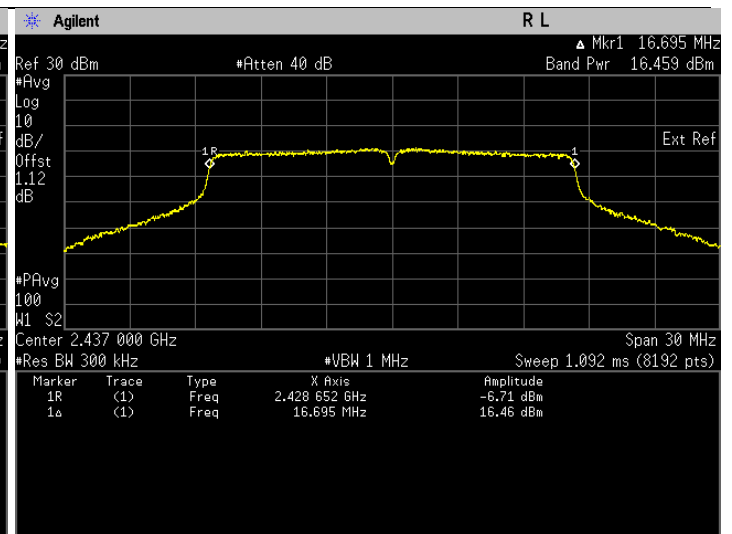
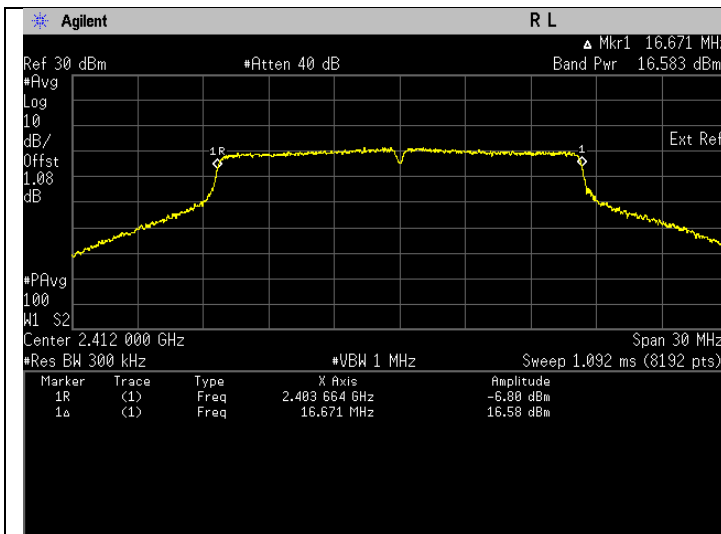
Frequency 802.11b MHz

802.11g

$$\text{Output Power} = \text{Band Power} + \text{Duty Cycle Factor}$$

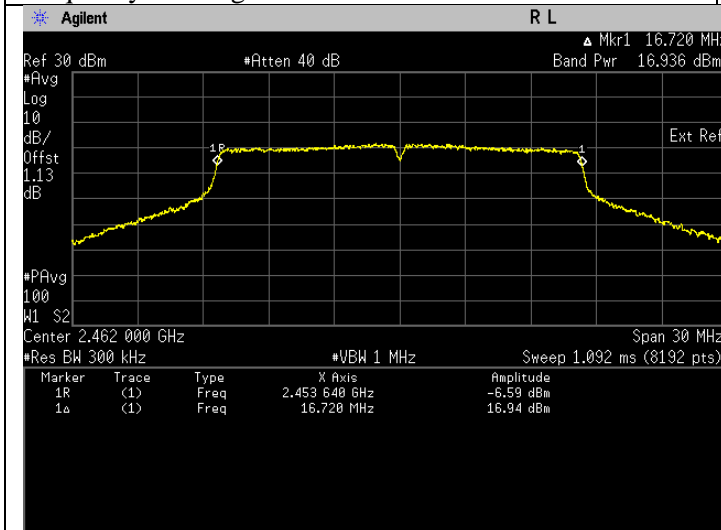
$$= \text{Band Power} + 0.07\text{dBm}$$

Test Conditions				Test Frequency	Results	
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Output Power (dBm)	Status
802.11g	OFDM	BPSK	6	2412	16.659	Pass
802.11g	OFDM	BPSK	6	2437	16.535	Pass
802.11g	OFDM	BPSK	6	2462	17.012	Pass



Frequency 802.11g MHz

Frequency 802.11g MHz

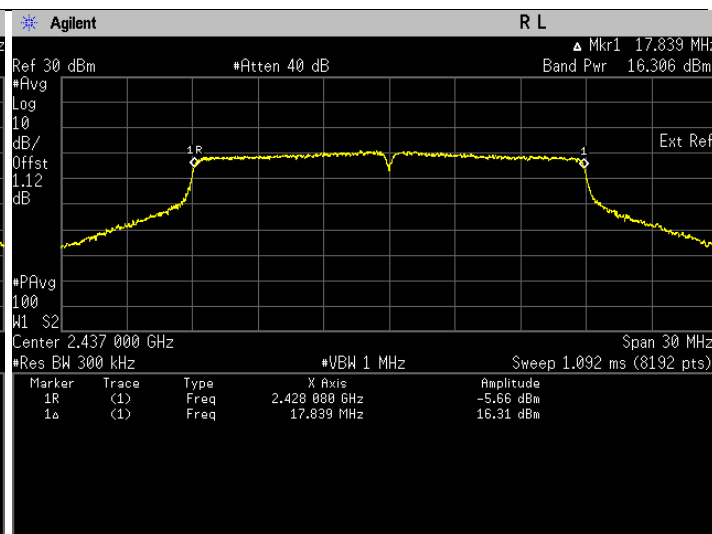
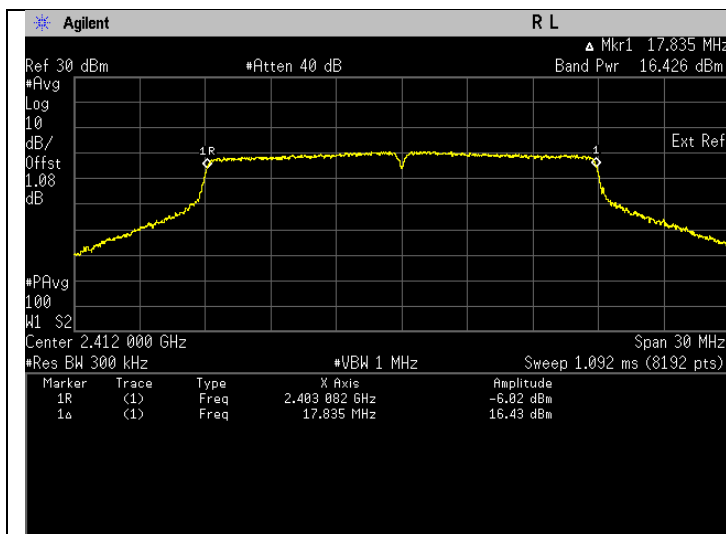


Frequency 802.11g MHz

802.11n (HT20)

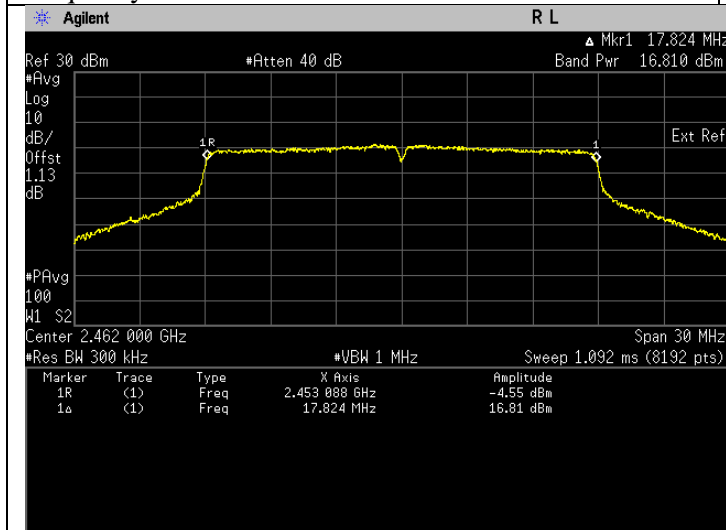
Output Power = Band Power + Duty Cycle Factor
 = Band Power + 0.080dBm

Test Conditions				Test Frequency	Results	
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Output Power (dBm)	Status
802.11n	OFDM	BPSK	6.5	2412	16.506	Pass
802.11n	OFDM	BPSK	6.5	2437	16.386	Pass
802.11n	OFDM	BPSK	6.5	2462	16.890	Pass



Frequency 802.11n MHz

Frequency 802.11n MHz

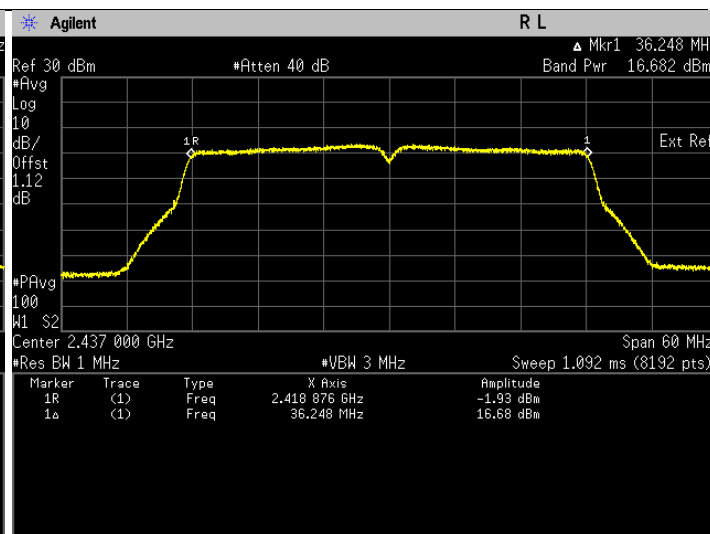
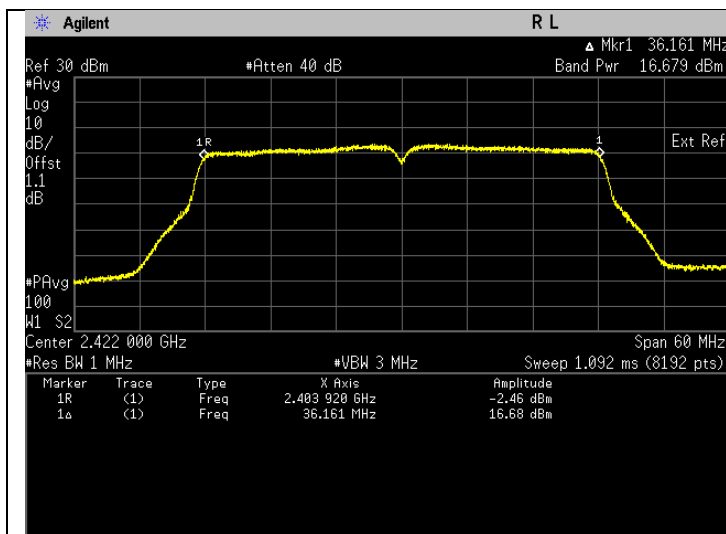


Frequency 802.11n MHz

802.11n (HT40)

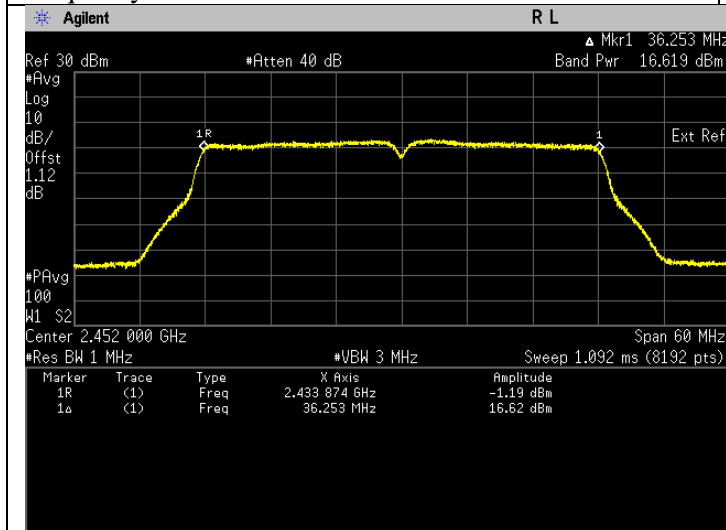
Output Power = Band Power + Duty Cycle Factor
 = Band Power + 0.225dBm

Test Conditions				Test Frequency	Results	
Standard	Modulation Type	Modulation Technology	Data Rate (mbps)	Tx (MHz)	Output Power (dBm)	Status
802.11n	OFDM	BPSK	13.5	2422	16.904	Pass
802.11n	OFDM	BPSK	13.5	2437	16.907	Pass
802.11n	OFDM	BPSK	13.5	2452	16.844	Pass



Frequency 802.11n MHz

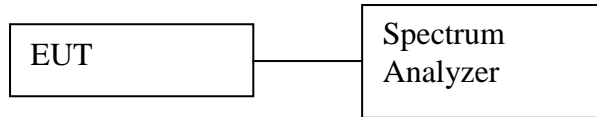
Frequency 802.11n MHz



Frequency 802.11n MHz

6.3.Duty Cycle of the test signal

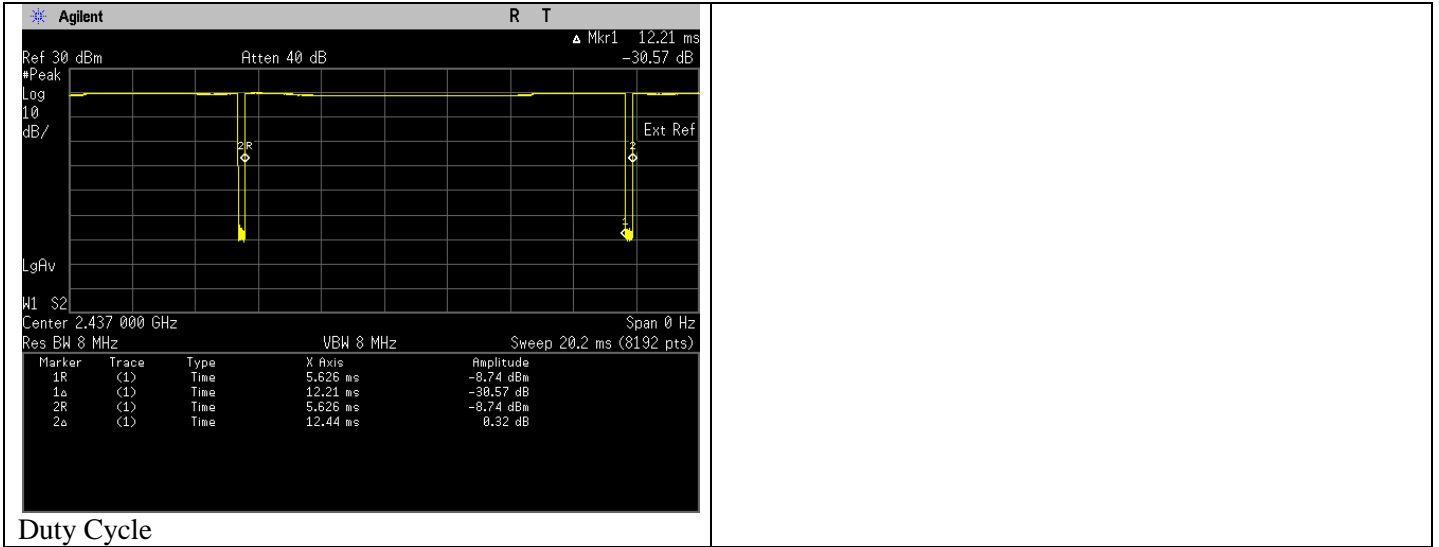
6.3.1. Test Setup



- 1) Check and ensure the spectrum analyzer well calibrate.
- 2) Turn on the DUT and set DUT to transmit maximum power.
- 3) Connect DUT's antenna terminal to spectrum analyzer with a low loss cable.
- 4) Setting of Spectrum analyzer :
 - a. Set the RBW = 10 MHz or the highest RBW available on spectrum analyzer.
 - b. Set the VBW \geq RBW.
 - c. Set the span \geq [1.5 \times DTS bandwidth].
 - d. Detector = Peak.
 - e. Sweep time = 10ms or others that allow to measure accurate duty cycle.
 - f. Trace mode = max hold.
 - g. Allow trace to fully stabilize.
- 5) Record the duty cycle as X and save the plot.
- 6) Measure every antenna port by repeat the step above for MIMO measurement.

6.3.2. Test Data

802.11b

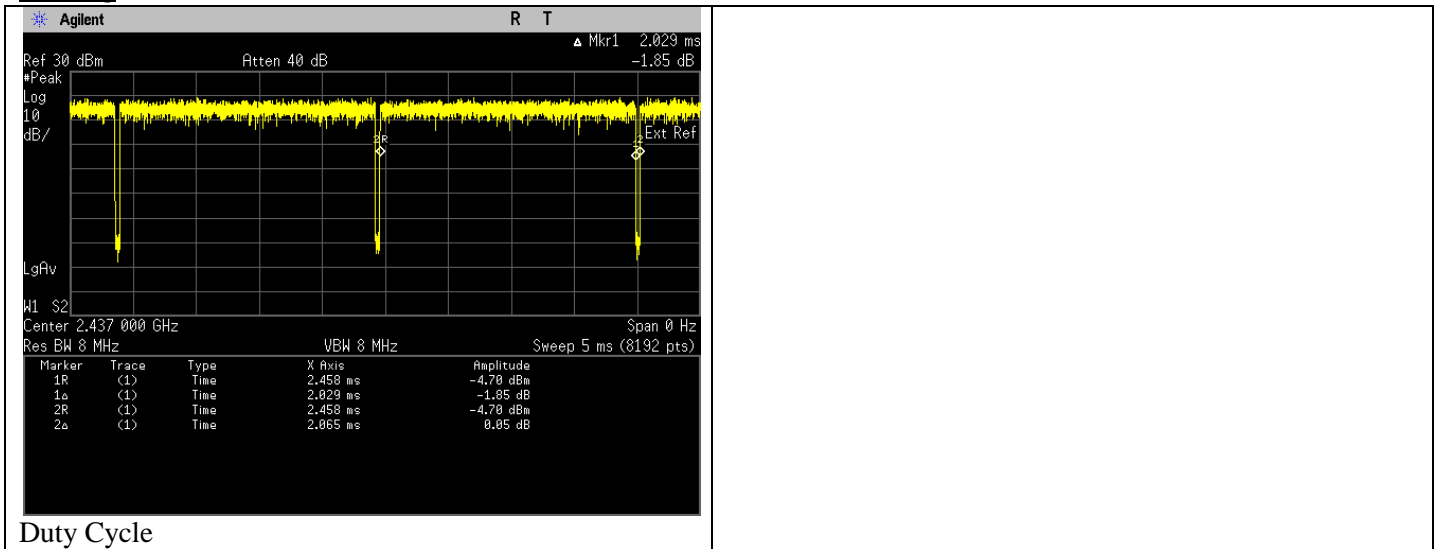


On time (ms)	12.21
On + Off Time (ms)	12.44
Duty cycle	0.9815
Duty Cycle factor	0.081

*Duty cycle = On time/ On +off time

*Duty Cycle factor = 10*log(1/Duty Cycle)

802.11g

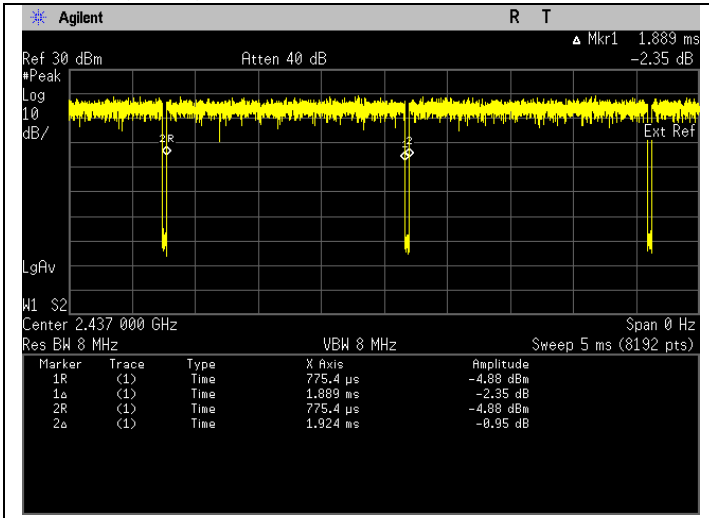


On time (ms)	2.029
On + Off Time (ms)	2.065
Duty cycle	0.9826
Duty Cycle factor	0.076

*Duty cycle = On time/ On +off time

*Duty Cycle factor = $10 \cdot \log(1/\text{Duty Cycle})$

802.11n (HT20)



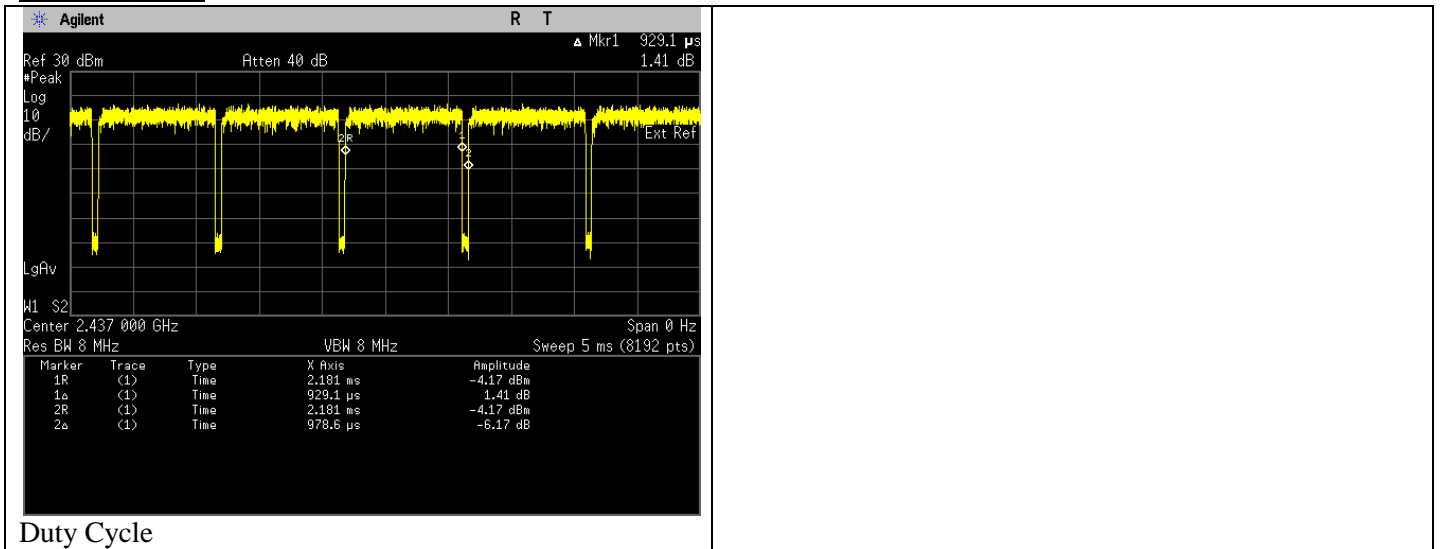
Duty Cycle

On time (ms)	1.889
On + Off Time (ms)	1.924
Duty cycle	0.9818
Duty Cycle factor	0.080

*Duty cycle = On time/ On +off time

*Duty Cycle factor = $10 \cdot \log(1/\text{Duty Cycle})$

802.11n (HT40)



Duty Cycle

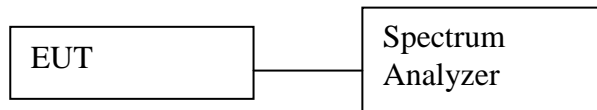
On time (ms)	0.9291
On + Off Time (ms)	0.9786
Duty cycle	0.9494
Duty Cycle factor	0.225

*Duty cycle = On time/ On +off time

*Duty Cycle factor = 10*log(1/Duty Cycle)

6.4. Maximum Peak Power Spectral Density

6.4.1. Test Setup



Maximum Peak

- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the DUT and set DUT to transmit maximum power.
- c) Connect DUT's antenna terminal to spectrum analyzer with a low loss cable.
- d) Setting of Spectrum analyzer :
 - a. Set analyzer center frequency to DTS channel center frequency.
 - b. Set the span to 1.5 times the DTS bandwidth.
 - c. Set the RBW to $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
 - d. Set the VBW $\geq [3 \times \text{RBW}]$.
 - e. Detector = peak.
 - f. Sweep time = auto couple.
 - g. Trace mode = max hold.
 - h. Allow trace to fully stabilize.
 - i. Use the peak marker function to determine the maximum amplitude level within the RBW.
 - j. If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.
- e) Measure every antenna port by repeat the step above for MIMO measurement.

6.4.2. Test Limits

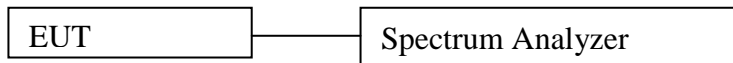
Normal Condition (25 ° C)
$\leq 8 \text{ dBm/3kHz}$

6.4.3. Test Result

NA

6.5. Conducted Spurious Emission

6.5.1. Test Setup



- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the DUT and set DUT to transmit maximum power.
- c) Connect DUT's antenna terminal to spectrum analyzer with a low loss cable.
- d) Setting of Spectrum analyzer :
 - a. RBW = 100 kHz
 - b. VBW = 300 kHz
 - c. Detector mode = Peak
 - d. Trace = Max Hold
 - e. Sweep = auto
- e) Use the peak marker function to measure highest emission and scan up to 10th harmonic.
- f) Measure every antenna port by repeat the step above for MIMO measurement.

6.5.2. Test Limits:

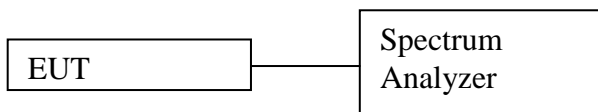
Normal Condition (25 ° C)
Shall be at least 30 dB below peak (max) power.

6.5.3. Test Result

NA

6.6. Band edge Conducted Spurious Emission

6.6.1. Test Setup



- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the DUT and set DUT to transmit maximum power.
- c) Connect DUT's antenna terminal to spectrum analyzer with a low loss cable.
- d) Setting of Spectrum analyzer :
 - a. RBW = 100 kHz
 - b. VBW = 300 kHz
 - c. Detector mode = Peak
 - d. Trace = Max Hold
 - e. Sweep = auto
- e) Use the peak marker function to measure highest emission.
- f) Measure every antenna port by repeat the step above for MIMO measurement.

6.6.2. Test Limits:

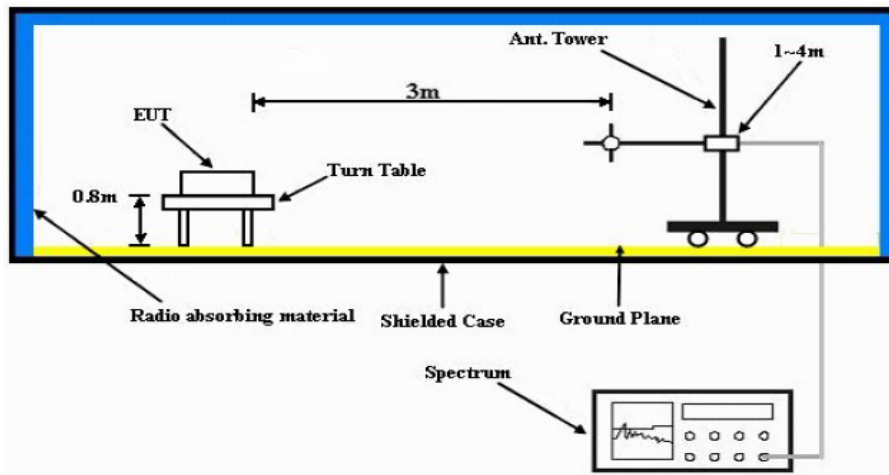
Normal Condition (25 ° C)
Shall be at least 30 dB below peak (max) power.

6.6.3. Test Result

NA

6.7. Radiated Emission within restricted Bands

6.7.1. Test Setup



- The EUT is placed on the top of a rotating table 0.8m above the ground (<1GHz) and 1.5m above the ground (>1GHz) at a 3m semi-anechoic chamber. The table is rotated 360 degrees to determine the position of the highest radiation.
- The EUT is set 3m away from the interference-receiving antenna, which is mounted on the top of a variable-height antenna tower.
- The antenna is Bilog/Horn antenna depend on which frequency range uses, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT is arranged to its worst case and then the antenna is tuned to heights from 1m to 4m and the rotatable table is turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system is set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode is fall within the range of 10dB from the limit specified, the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. Otherwise, the testing could be stopped and the peak values of the EUT would be reported.

NOTE:

- The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection at frequency below 1GHz.
- The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3 MHz for Peak detection at frequency above 1 GHz.
- All modes of operation were investigated and the worst-case emissions are reported.

6.7.2. Test Limits:

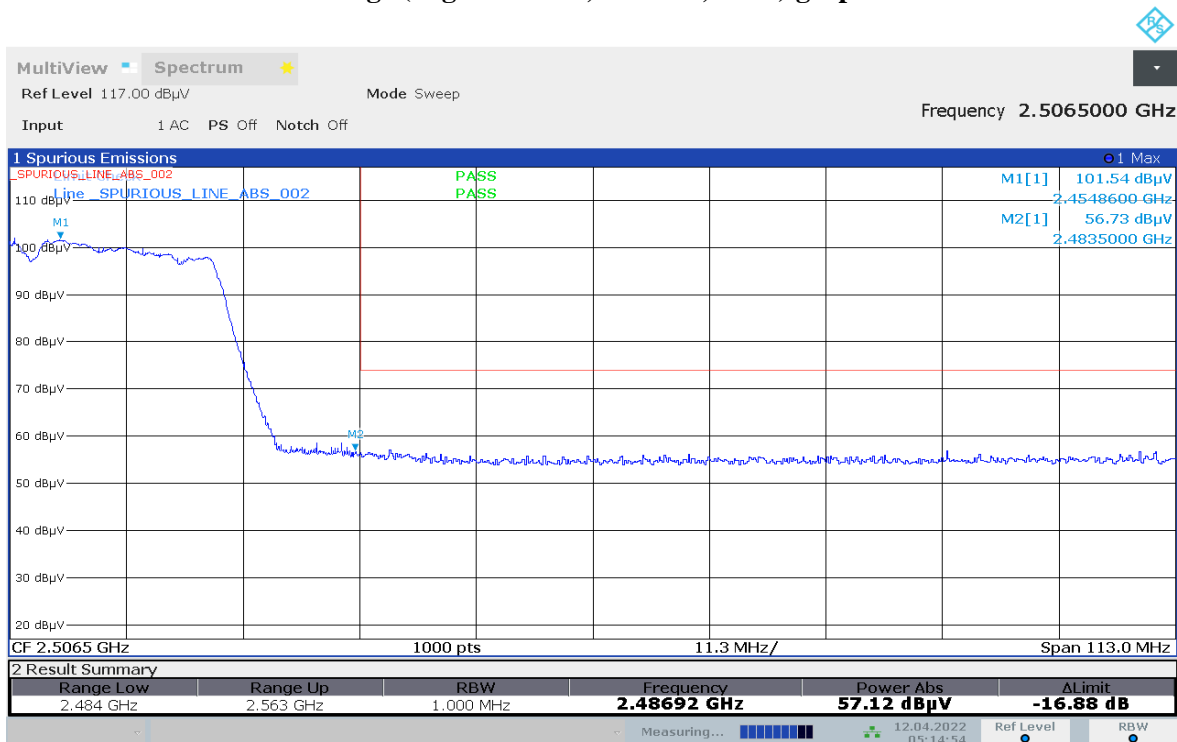
Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

NOTE:

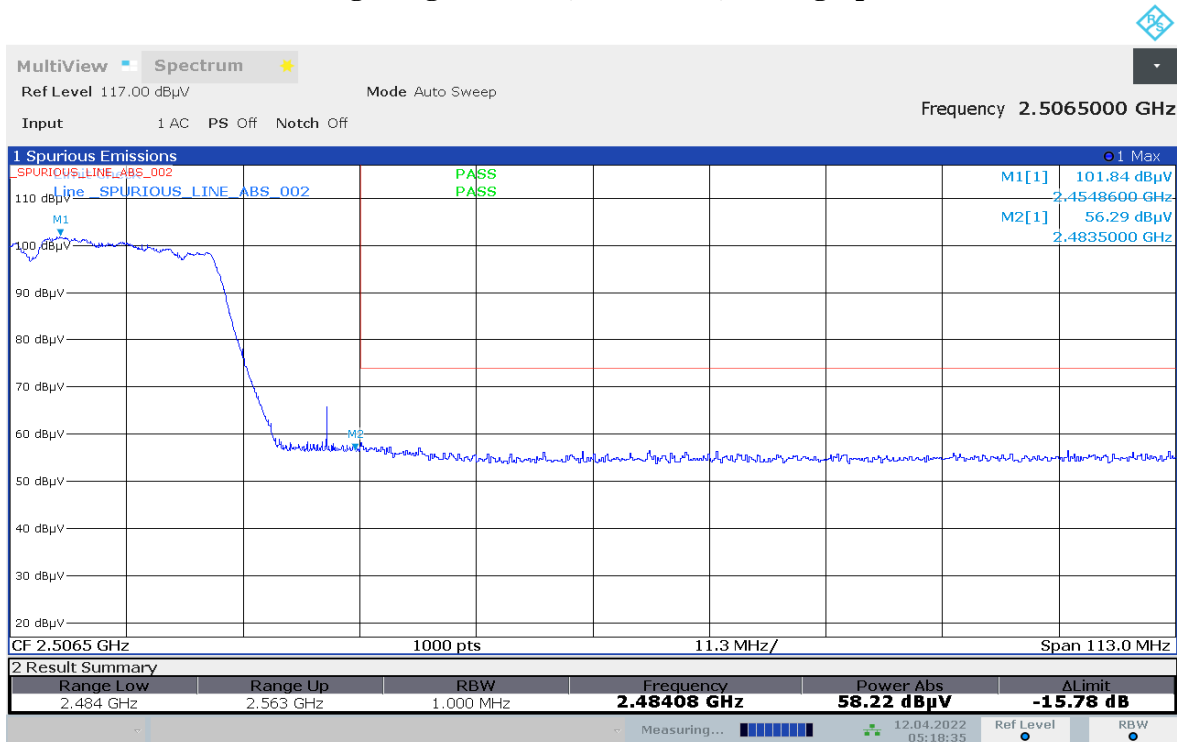
- a. The lower limit shall apply at the transition frequencies.
- b. Emission level (dBuV/m) = 20 log Emission level (uV/m).
- c. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

Restricted Band Edge (High Channel, Vertical, Peak) graphical screen shot



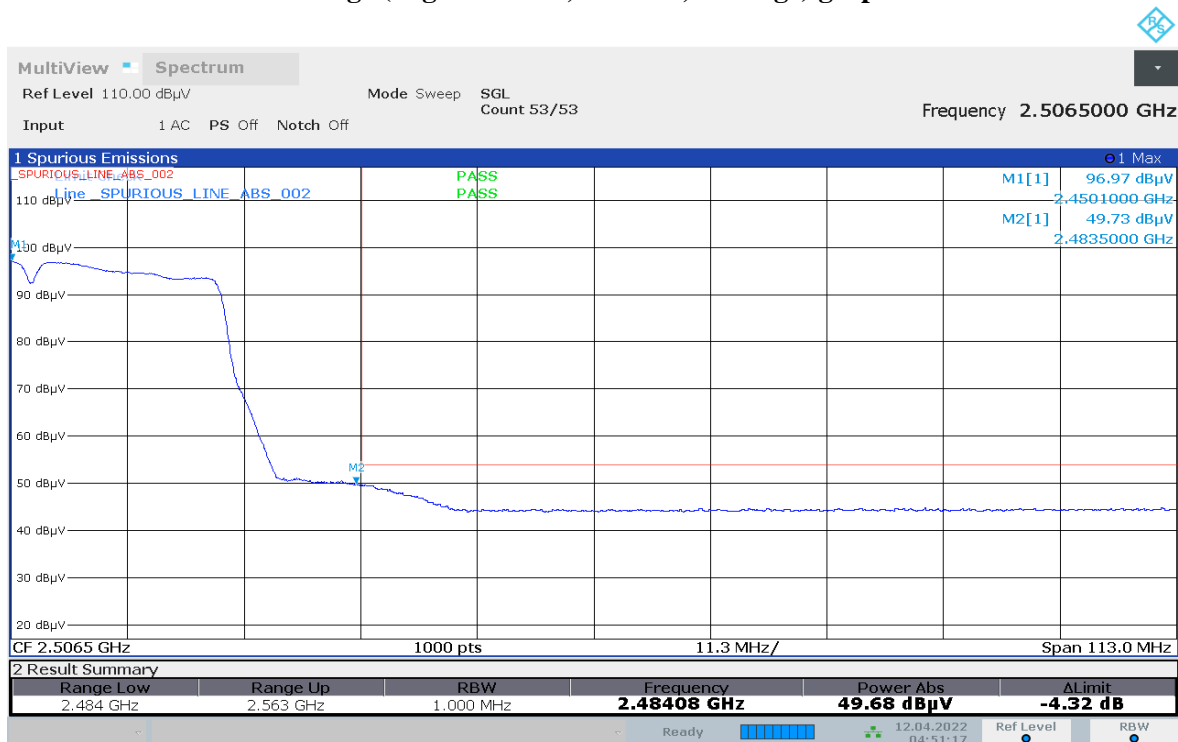
05:14:54 12.04.2022

Restricted Band Edge (High Channel, Horizontal, Peak) graphical screen shot



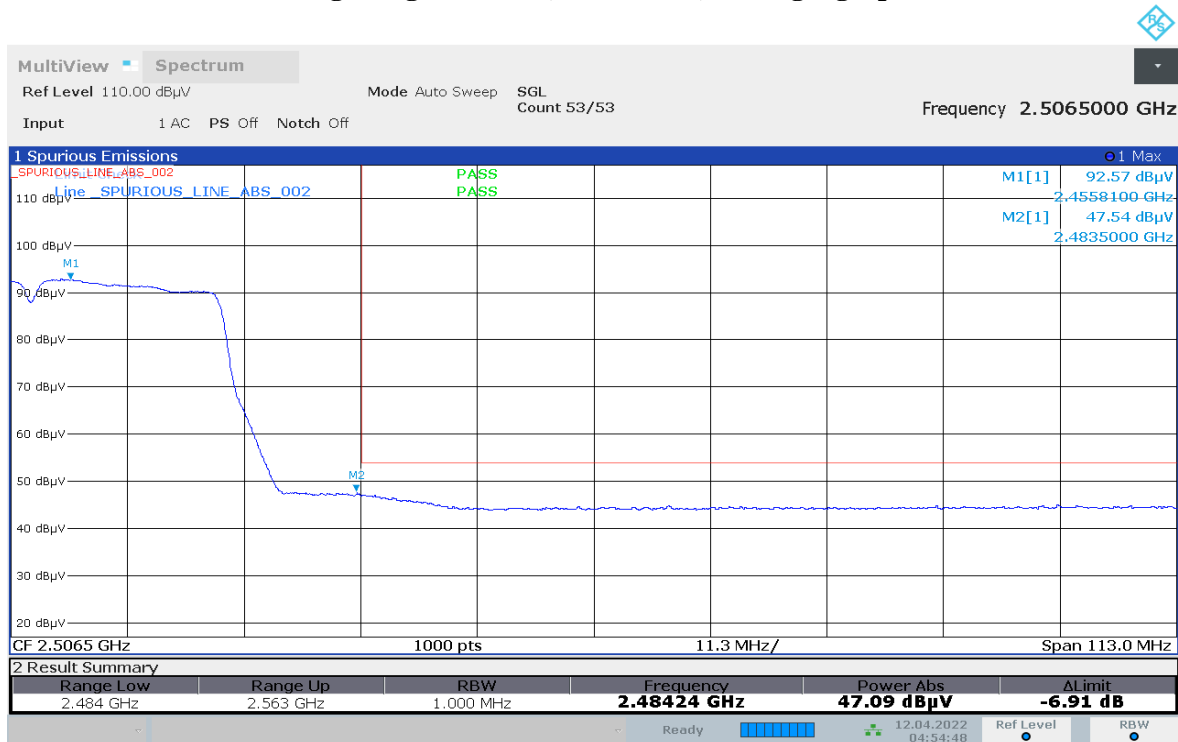
05:18:35 12.04.2022

Restricted Band Edge (High Channel, Vertical, Average) graphical screen shot



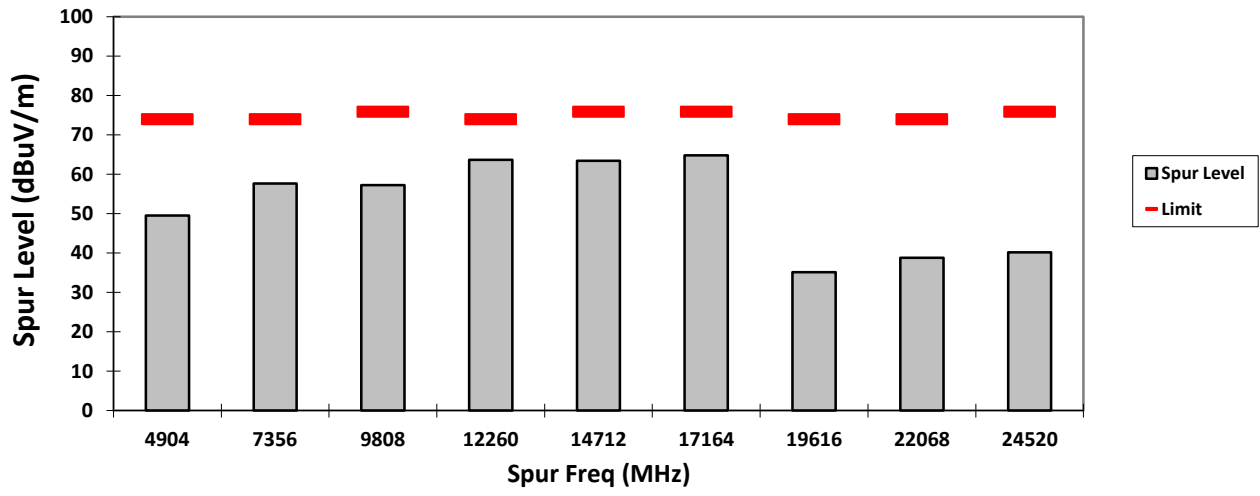
04:51:18 12.04.2022

Restricted Band Edge (High Channel, Horizontal, Average) graphical screen shot

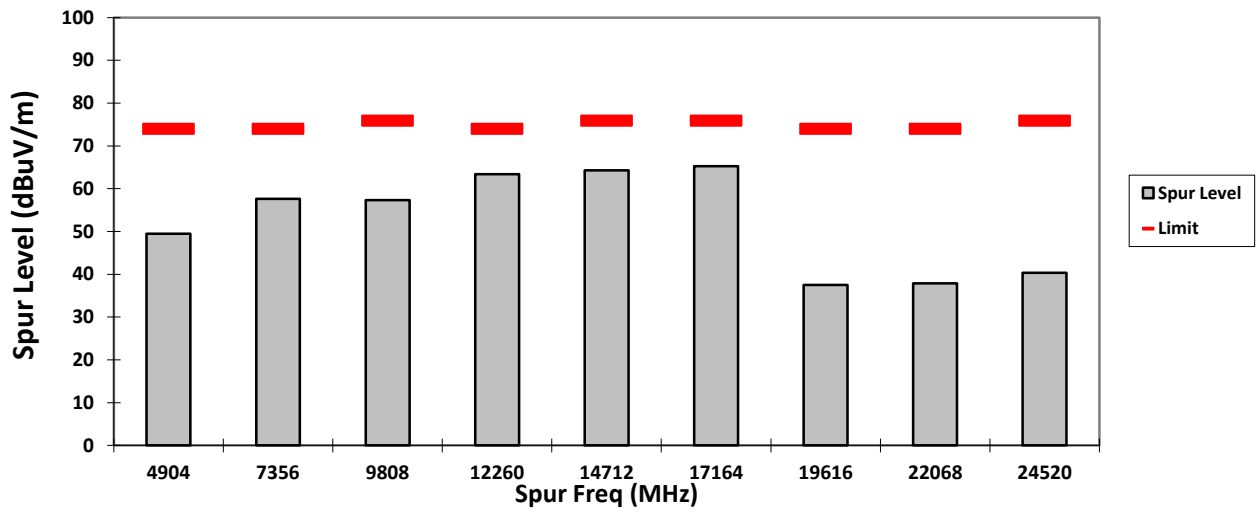


04:54:49 12.04.2022

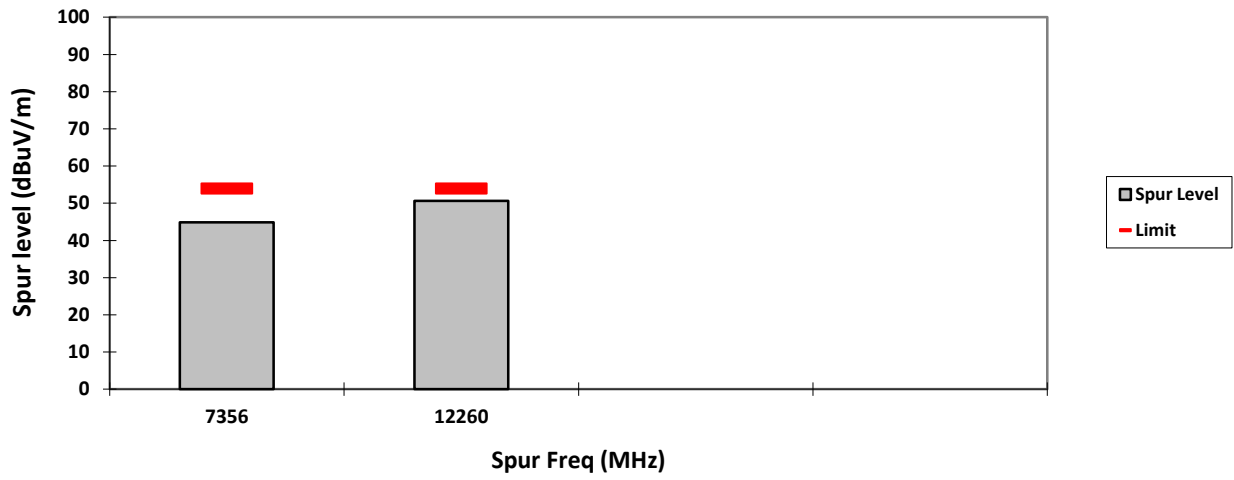
VERTICAL, PK



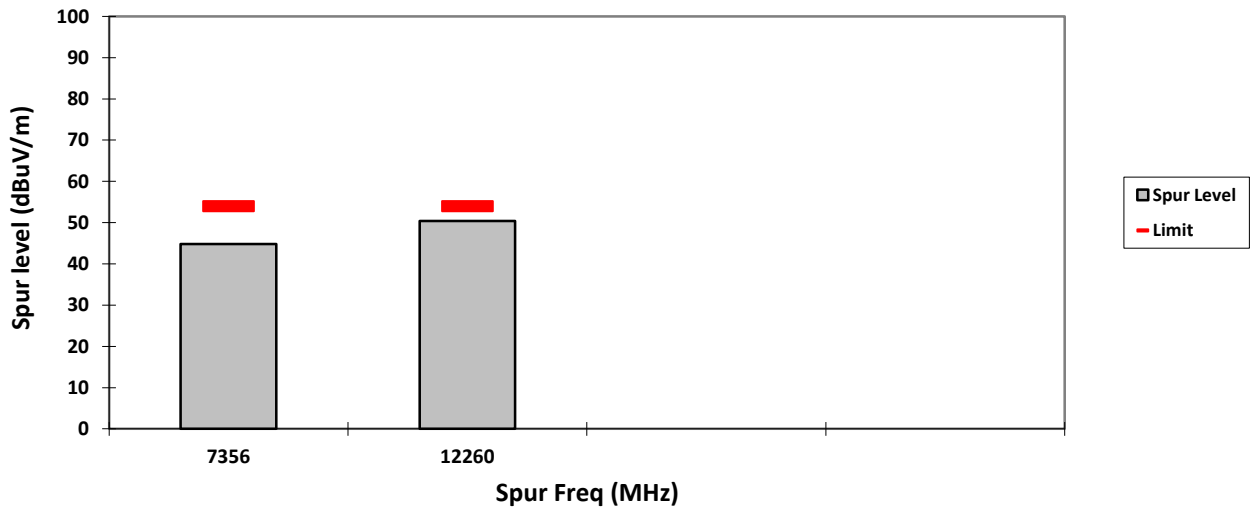
HORIZONTAL, PK



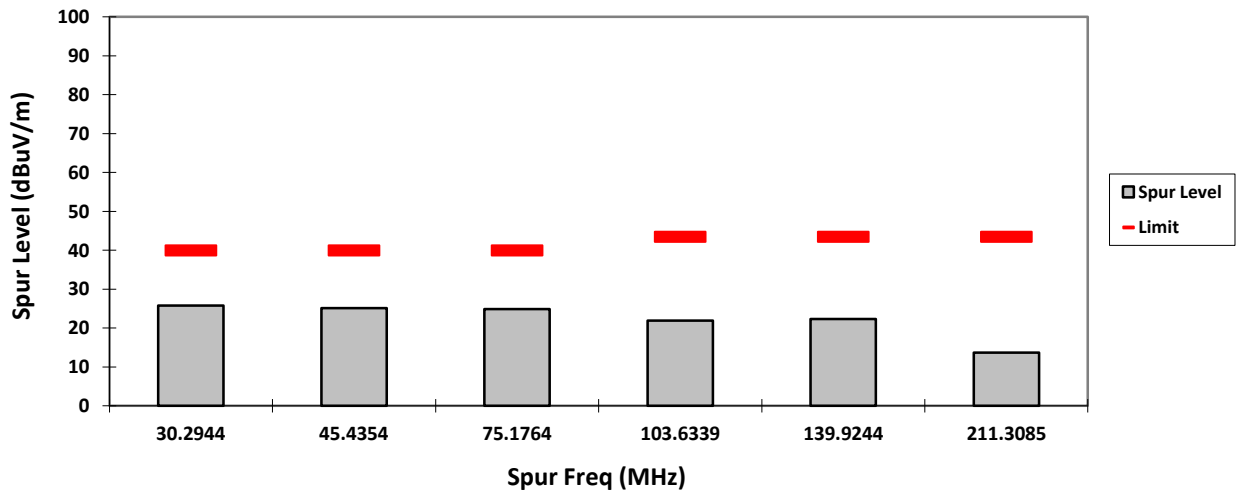
VERTICAL, AV



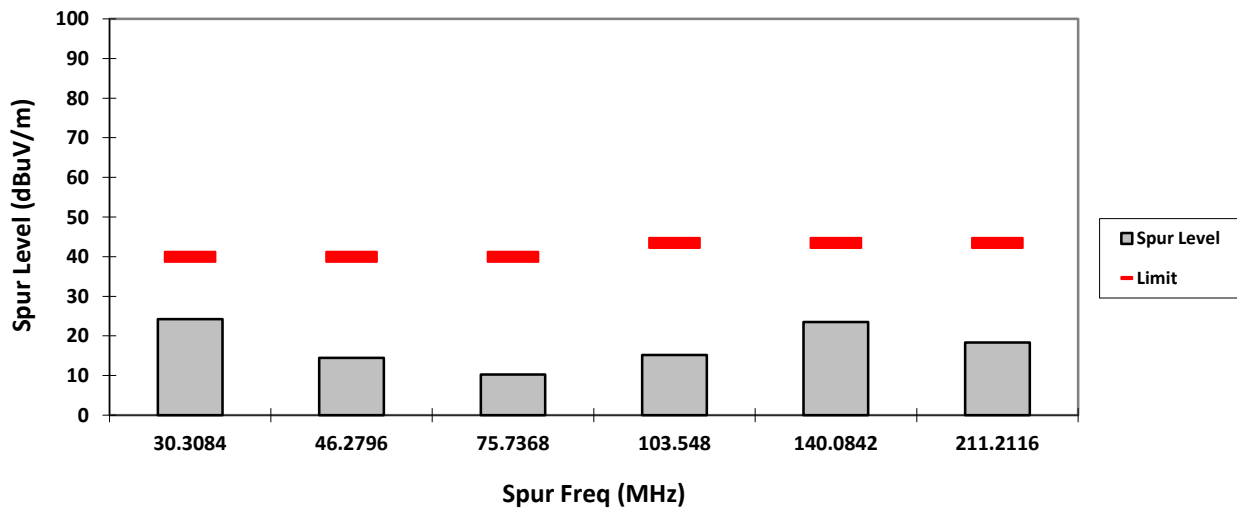
HORIZONTAL, AV



VERTICAL, QPK

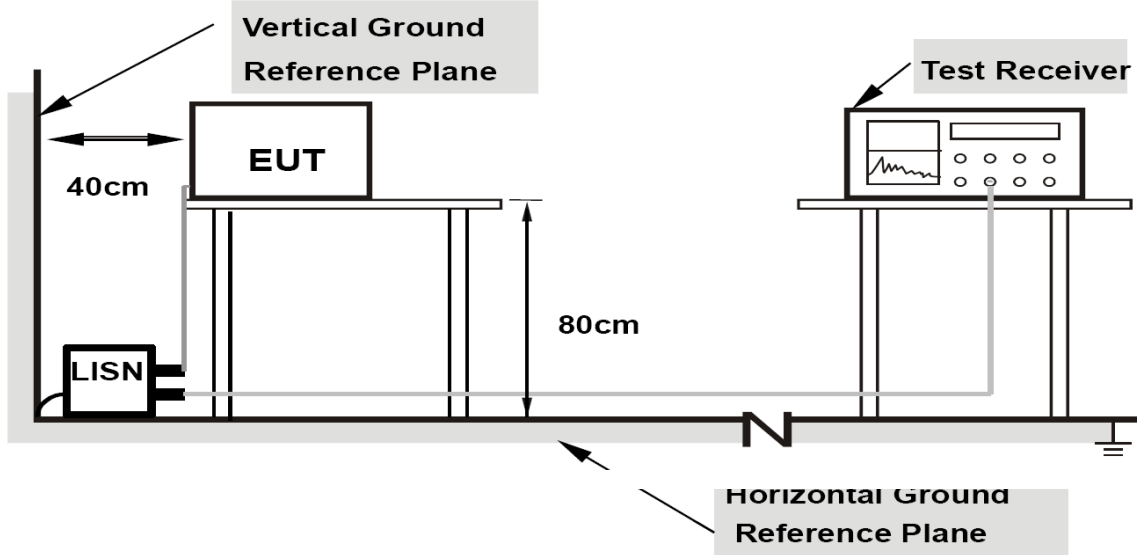


HORIZONTAL, QPK



6.8. AC Powerline Conducted Emission

6.8.1. Test Setup



- 1) Tests were conducted for both Receive and Transmit Mode of the EUT.
- 2) The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50uH of coupling impedance for the measuring instrument.
- 3) Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- 4) The frequency range from 150 kHz to 30MHz was measured.

6.8.2. Test Limits:

For AC Power Line Conducted Test Limit can be Class A or B depends on product classification.

Limits for conducted disturbance at the mains ports of class A ITE

Frequency range MHz	Limits dB(μV)	
	Quasi-peak	Average
0,15 to 0,50	79	66
0,50 to 30	73	60

NOTE The lower limit shall apply at the transition frequency.

Table 1: Limits for Conducted Disturbance at the Mains Ports of Class A ITE.

**Limits for conducted disturbance at the mains ports
of class B ITE**

Frequency range MHz	Limits dB(μ V)	
	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50

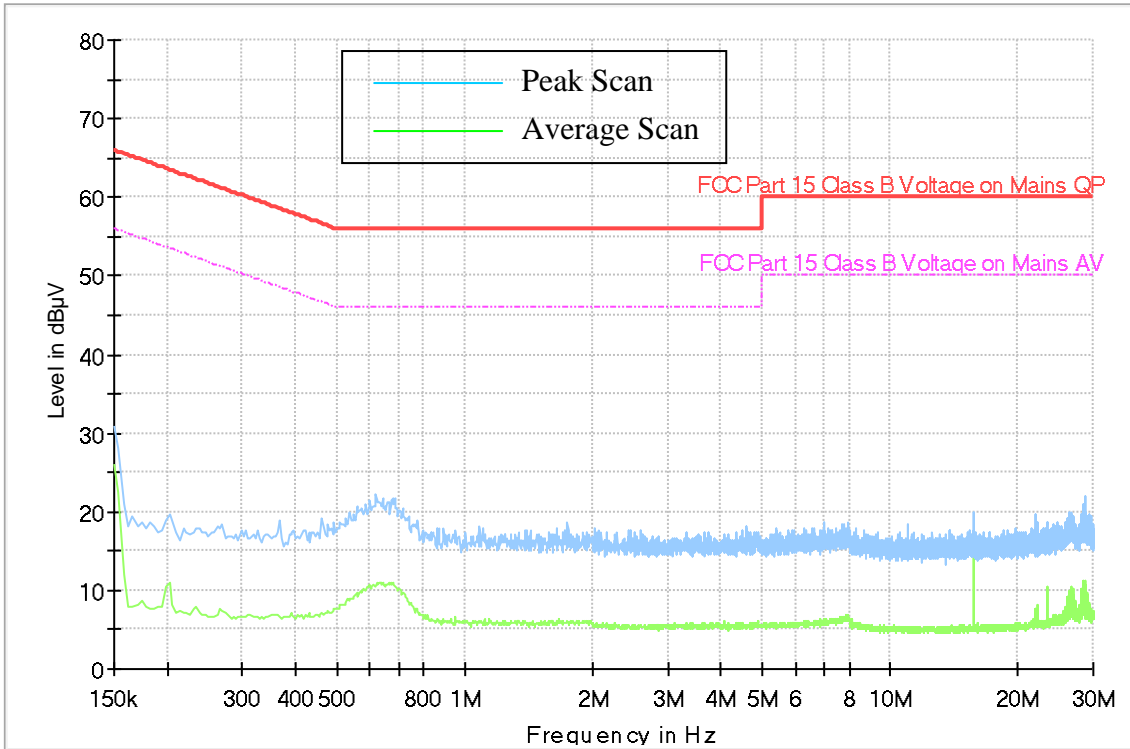
NOTE 1 The lower limit shall apply at the transition frequencies.
NOTE 2 The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz.

Table 2: Limits for Conducted Disturbance at the Mains Ports of Class B ITE

6.8.3. Test Result

1) Ambient

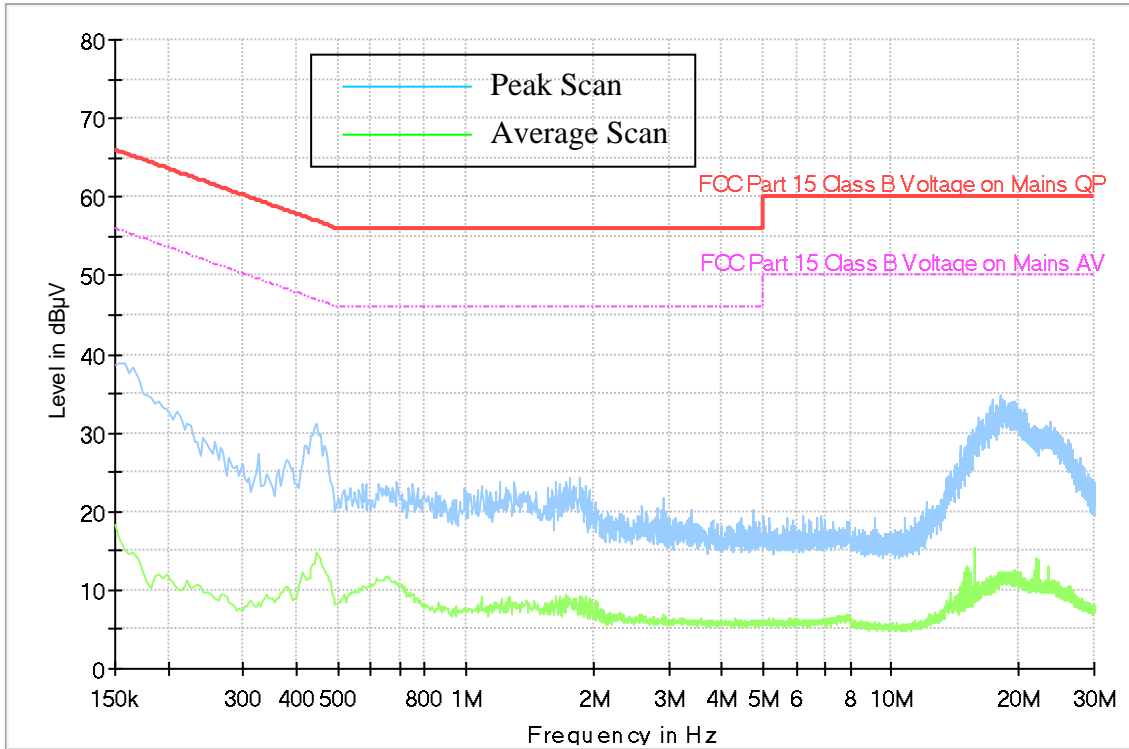
Full Spectrum



120VAC , 60Hz

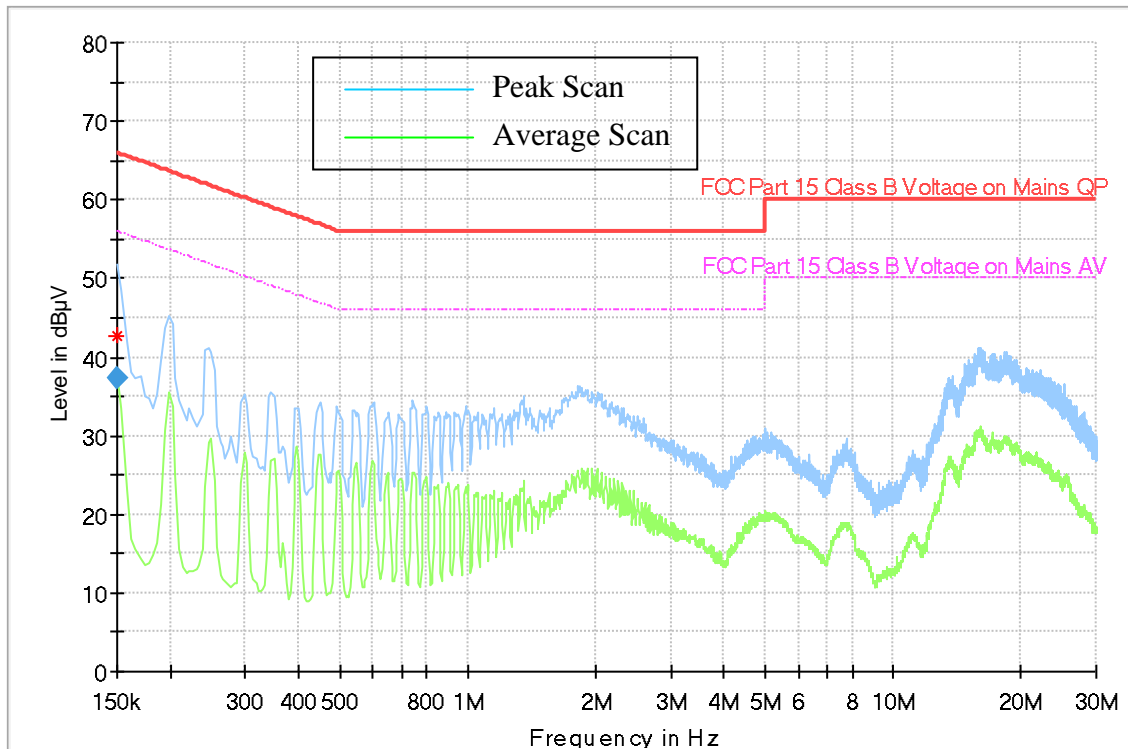
1) Charger Alone

Full Spectrum



2) Charger + Radio Off

Full Spectrum



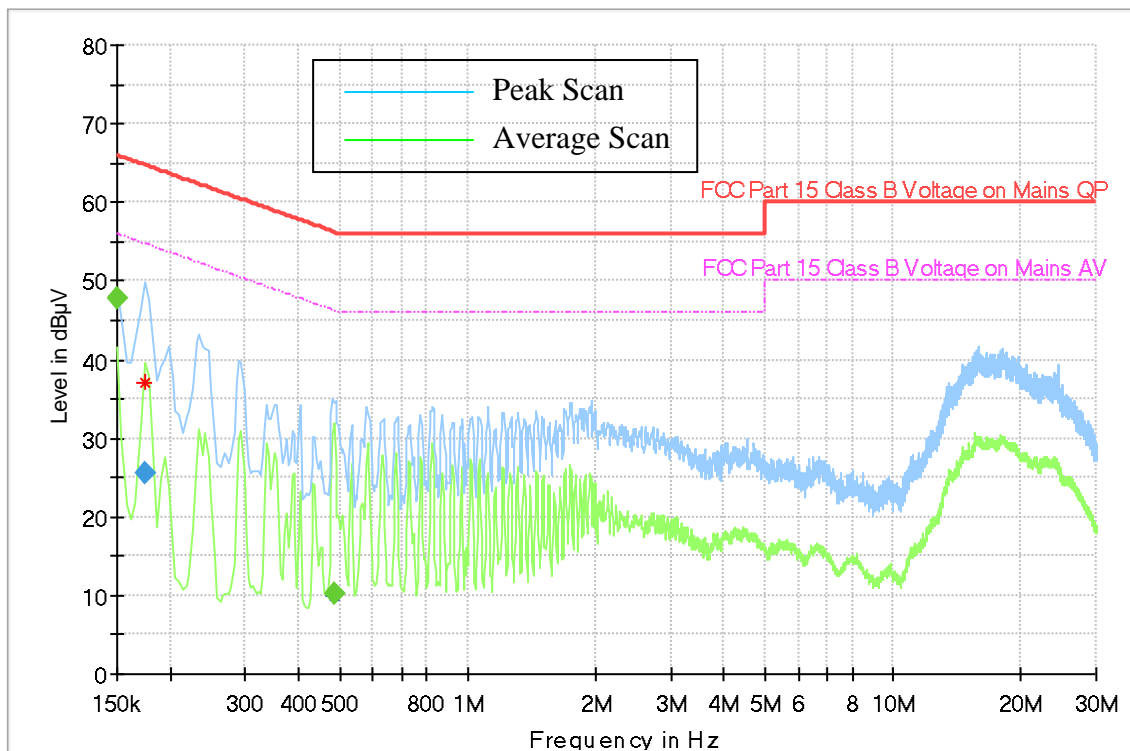
Quasipeak and Average Measurement

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)	Comment
0.150000	37.28	---	66.00	28.72	1000.0	9.000	N	ON	10.5	PASS

* Expanded Uncertainty (U) = +/- 3.48dB

3) Charger + Radio Standby

Full Spectrum



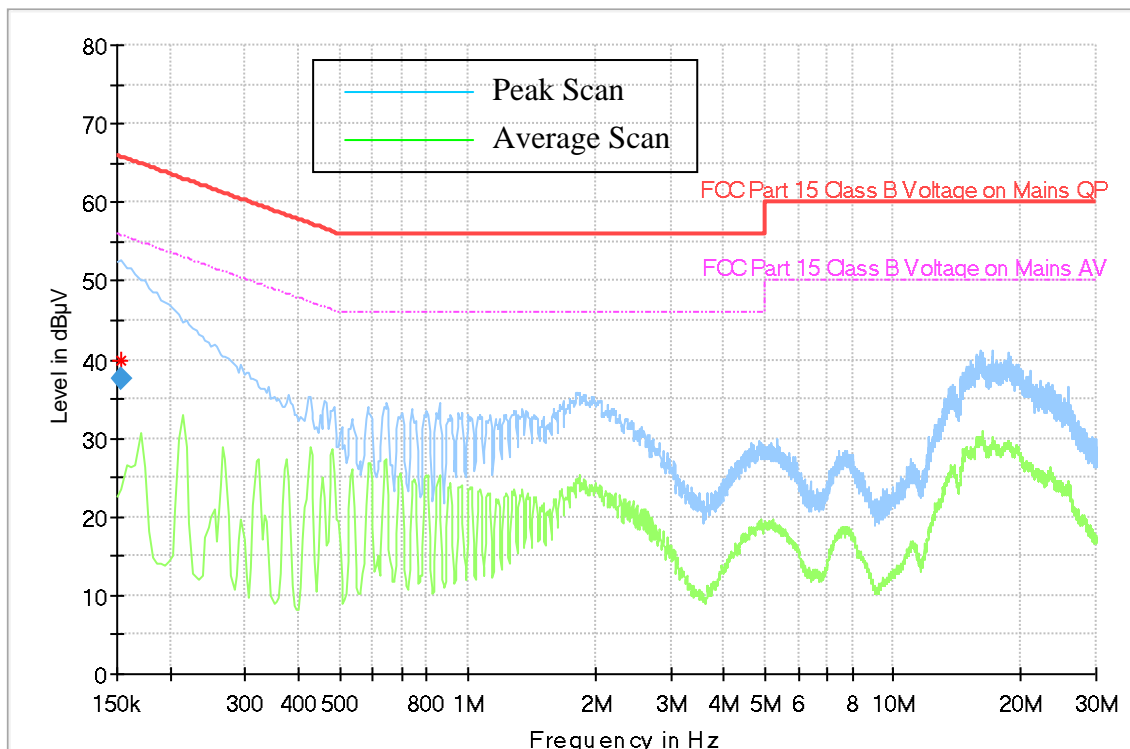
Quasipeak and Average Measurement

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)	Comment
0.150000	---	47.82	56.00	8.18	1000.0	9.000	N	ON	10.5	PASS
0.174000	25.52	---	64.77	39.25	1000.0	9.000	L1	ON	10.8	PASS
0.486000	---	10.22	46.24	36.02	1000.0	9.000	L1	ON	10.6	PASS

* Expanded Uncertainty (U) = +/- 3.48dB

4) Charger + Radio in WIFI 2.4Ghz (Tx)

Full Spectrum



Quasipeak and Average Measurement

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)	Comment
0.154000	37.56	---	65.78	28.22	1000.0	9.000	L1	ON	10.5	PASS

* Expanded Uncertainty (U) = +/- 3.48dB

END OF TEST REPORT